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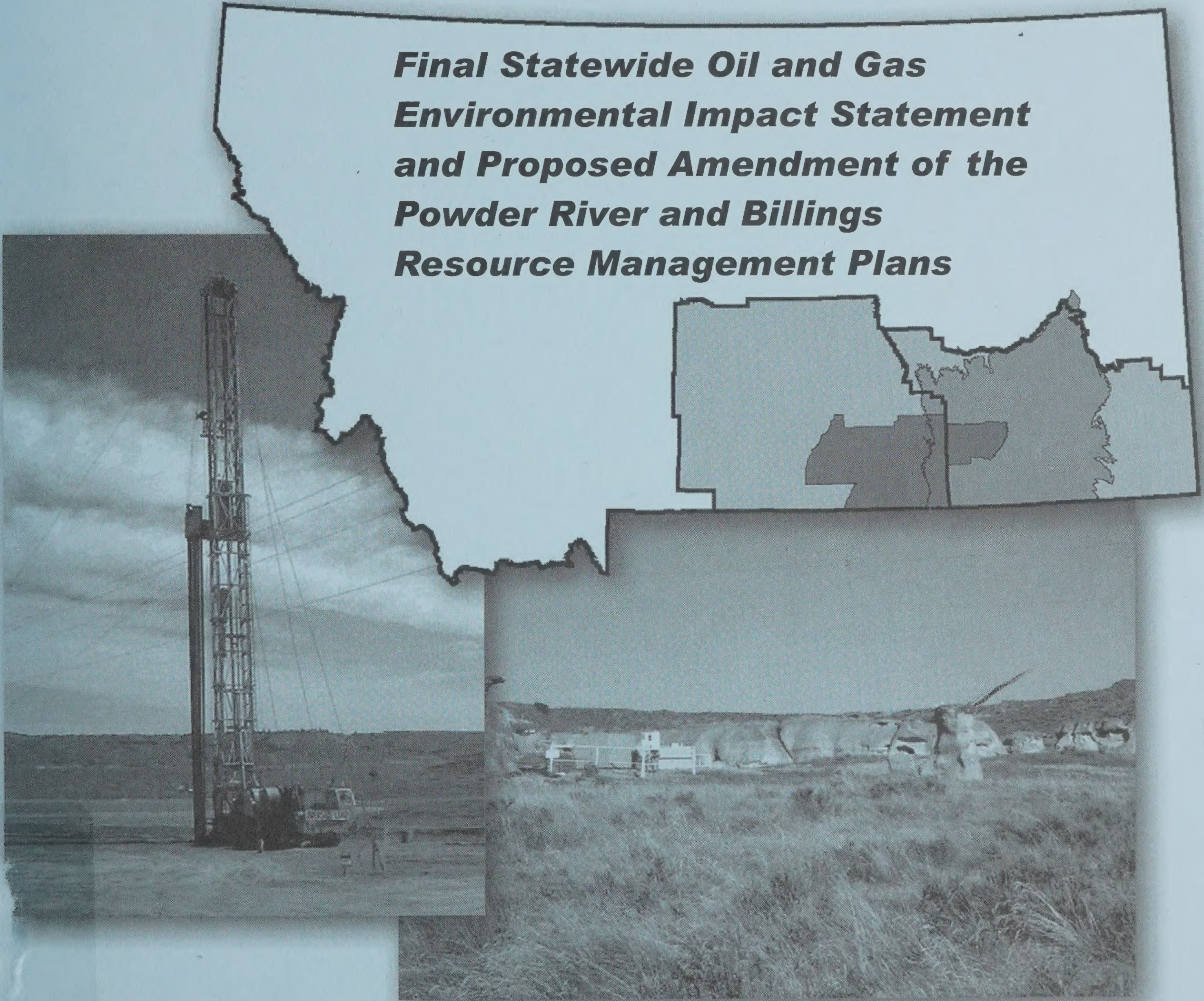
# MONTANA



## *Final Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings Resource Management Plans*

## VOLUME II

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based on the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation; rangelands; timber; minerals; watershed; fish and wildlife; wilderness; air; and scenic, scientific, and cultural values.

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# APPENDICES

MONTANA

# AIR QUALITY MODELING APPENDIX

# AIR QUALITY MODELING APPENDIX

## Air Quality Impact Technical Support Document

he following technical support document describes the processes used to conduct the air quality impact assessment, and provides summaries of relevant analysis data:

**Argonne National Laboratory.**
2002. Technical Support Document - Air Quality Impact Assessment for the Montana Statewide Final Oil and Gas EIS and Amendment of the Powder River and Billings Resource Management Plans and the Wyoming Final EIS and Planning Amendment for the Powder River Basin Oil and Gas Development Project. Prepared for the U.S. Department of the Interior, Bureau of Land Management, Montana and Wyoming State Offices, by the Environmental Assessment Division, Argonne National Laboratory. Argonne, Illinois.

Copies of this technical support document are available upon request from:

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## 1.0 Introduction

Air pollution impacts are limited by local, state, tribal and federal air quality regulations, standards, and implementation plans established under the CAA and administered by the MDEQ and the EPA. Although not applicable to the proposed Alternatives, the WYDEQ has similar jurisdiction over potential air pollutant emission sources in Wyoming, which can have a cumulative impact with MDEQ approved sources. Air quality regulations require certain proposed new, or modified existing, air pollutant emission sources (including CBM compression facilities) undergo a permitting review before their construction can begin. Therefore, the applicable air quality regulatory agencies have the primary authority and responsibility to review permit applications and to require emission permits, fees and control devices, prior to construction and/or operation.

Fugitive dust and exhaust from construction activities, along with air pollutants emitted during operation (i.e., well operations, field [booster] and sales [pipeline] compressor engines, etc.), are potential causes of air quality impacts. These issues are more likely to generate public concern where natural gas development activities occur near residential areas. The FS, NPS, and the FWS have also expressed concerns regarding potential atmospheric deposition (acid rain) and visibility impacts within distant downwind PSD Class I and PSD Class II areas under their administration, located throughout Montana, Wyoming, southwestern North Dakota, western South Dakota, and northwestern Nebraska.

## 2.0 Existing Air Quality

As described in **Chapter 3 - Affected Environment (Air Quality)**, specific air quality monitoring is not conducted throughout most of the CBM emphasis area, but air quality conditions are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations. Air quality monitoring is the appropriate tool for determining compliance with the NAAQS for both particulate matter with an aerodynamic diameter equal to or less than ten microns in diameter ($PM_{10}$) and nitrogen dioxide ($NO_2$). As part of the Air Quality Impact Assessment prepared by Argonne National Laboratory (Argonne 2002), monitoring data measured throughout the southeastern Montana and northeastern Wyoming were assembled and reviewed. Although monitoring is primarily conducted in urban or industrial areas, the data selected are considered to be the best available representation of background air pollutant concentrations throughout the CBM emphasis area. Specific values presented in Table AQ-1 were used to define background conditions in the air quality impact analysis. The selected background pollutant concentrations are below applicable ambient air quality standards for all pollutants and averaging times. These National and Montana standards, and the PSD increment values, are also presented in Table AQ-1.

Note that for evaluating consumption of the $PM_{10}$ and $NO_2$ increments in Montana and Wyoming, as well as on Indian Reservations, modeling performed by an air quality regulatory agency is the appropriate tool (emissions solely from surface coal mines being the only exception). It should be noted that the BLM model used to identify and analyze impacts in this EIS is not intended or designed to be a regulatory PSD increment consumption modeling process.

### TABLE AQ-1
### ASSUMED BACKGROUND CONCENTRATIONS, APPLICABLE AMBIENT AIR QUALITY STANDARDS, AND PSD INCREMENT VALUES (IN ($\mu G/M^3$)

| Pollutant | Averaging Time [a] | Background Concentration | National Ambient Air Quality Standards | Montana Ambient Air Quality Standards | PSD Class I Increment | PSD Class II Increment |
|---|---|---|---|---|---|---|
| Carbon Monoxide | 1-hour | 15,000 | 40,000 | 40,000 | N/A | N/A |
| | 8-hours | 6,600 | 10,000 | 10,000 | N/A | N/A |
| Lead | Quarterly | N/A | 1.5 | 1.5 | N/A | N/A |
| Nitrogen Dioxide | 1-hour | 117 | N/A | 566 | N/A | N/A |
| | Annual | 11 | 100 | 100 | 2.5 | 25 |
| Ozone | 1-hour | N/A | 235 | 196 | N/A | N/A |
| | 8-hours | 100 | 157 | N/A | N/A | N/A |
| $PM_{2.5}$ | 24-hours | 20 | 65 | N/A | N/A | N/A |
| | Annual | 8 | 15 | N/A | N/A | N/A |
| $PM_{10}$ | 24-hours | 105 | 150 | 150 | 8 | 30 |
| | Annual | 30 | 50 | 50 | 4 | 17 |
| Sulfur Dioxide | 1-hour | 666 | N/A | 1,300 | N/A | N/A |
| | 3-hours | 291 | 1,300 | N/A | 25 | 512 |
| | 24-hours | 73 | 365 | 260 | 5 | 91 |
| | Annual | 16 | 80 | 60 | 2 | 20 |

Source: Argonne (2002)
Notes:
$\mu g/m^3$ - micrograms per cubic meter
[a] Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.
N/A – data not available

Monitoring should be used to supplement modeling efforts, to:

1. Determine if identified levels of concern are exceeded, triggering the need to implement additional mitigation measures in order to avoid regulatory action
2. Provide additional indication of the need for regulatory modeling to determine if increments are being exceeded and an updated State Implementation Plan needed

The States of Wyoming and Montana will work with EPA to develop monitoring plans, which will consider population areas, modeled hot spots and other potential areas of concern. EPA will work with the Crow Tribe and Northern Cheyenne Tribe to identify the need for and to deploy additional monitoring as needed. The EIS predicts that full development of the Coal Bed Methane resource in

Montana, in culmination with non-project and RFFA sources, may generate criteria air pollutants (PM, VOCs and NOx) in sufficient quantities to require regulatory action on the part of MDEQ to protect both the PSD increments and the Montana and National Ambient Air Quality Standards. MDEQ will need to accurately predict the impacts of proposed projects during the New Source Review process and assure that both the ambient standards and the increments are protected. Once projects are up and running MDEQ will also require ambient monitoring data from appropriately sited monitors to verify the permit analysis projections and provide a feedback loop of current ambient data to make sure that future permitting decisions continue to protect the standards and increments. MDEQ can and will require ambient monitoring as a permit condition for major sources.

Additionally, much of the permit analysis for sources of this nature requires good ambient data to accurately predict project impacts. Permitting sources of $NO_2$ and Ozone ($O_3$-) precursors (VOCs)~~)~~, requires representative monitoring data to adequately analyze the expected impact of new emissions. Prediction of $NO_2$ is highly dependant on some knowledge of NO to $NO_2$ conversion rates. This information is supposed to come from either an analysis of actual NO/$NO_2$ ratios determined by monitoring results (preferred method), the use of a default value (very conservative and has recently resulted in predicted violations of the annual standard), or by the use of ambient Ozone data to predict conversion rates. Permitting large VOC sources raises similar questions. Ozone analysis requires at least some knowledge of atmospheric chemistry conversion rates in the area of analysis. At this time MDEQ does not have reliable data on the actual chemistry that is occurring in the development area and doesn't have any reliable background Ozone values.

Therefore, MDEQ will need NO/$NO_2$, $O_3$ and PM data for the development area from a regionally scaled ambient monitoring station. MDEQ has reviewed the modeling done for the EIS and a monitor sited in the Birney/Ashland area would be the best choice. Provided that funds become available, MDEQ would establish and maintain a monitoring station in this area.

It is important that monitors be deployed before CBM development occurs, or as early in the development cycle as possible, in order to provide baseline information and trend data.

# 3.0 Regulatory Framework

The National and Montana ambient air quality standards set the absolute upper limits for specific air pollutant concentrations at all locations where the public has access. The analysis of the proposed Alternatives must demonstrate continued compliance with all applicable local, state, tribal and federal air quality standards. Existing air quality throughout most of the CBM emphasis area is in attainment with all ambient air quality standards, as demonstrated by the relatively low concentration levels presented in Table AQ-1. However, three areas have been designated as federal nonattainment areas where the applicable standards have been violated in the past: Lame Deer ($PM_{10}$ - moderate) and Laurel (sulfur dioxide ($SO_2$) - primary), Montana; and Sheridan, Wyoming ($PM_{10}$ - moderate). Specific monitoring data collected by the Northern Cheyenne Tribe are presented in Table AQ-2.

Air quality regulations require certain proposed new, or modified existing, air pollutant emission sources (including CBM compression facilities) to undergo a permitting review before their construction can begin. Therefore, the applicable air quality regulatory agencies have the primary authority and responsibility to review permit applications and to require emission permits, fees and control devices, prior to construction and/or operation. In addition, the U.S. Congress (through the CAA Section 116) authorized local, state and tribal air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than federal requirements. Also, under FLPMA and the CAA, BLM cannot authorize any activity which would not conform to all applicable local, state, tribal and federal air quality laws, regulations, standards, and implementation plans.

Given most the CBM emphasis area's current attainment status, future development projects which have the potential to emit more than 250 tons per year of any criteria pollutant (or certain listed sources that have the potential to emit more than 100 tons per year) would be required to undergo a site-specific regulatory PSD Increment Consumption analysis under the federal New Source Review and permitting regulations. Development projects subject to the PSD regulations may also be required by the applicable air quality regulatory agencies to incorporate additional emission control measures (including a BACT analysis and determination) to ensure protection of air quality resources, and demonstrate that the combined impacts of all PSD sources will not exceed the allowable incremental air quality impacts for $NO_2$, $PM_{10}$, and $SO_2$.

The NEPA analysis compares potential air quality impacts from the proposed alternatives to applicable ambient air quality standards and PSD increments, but comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern for potential impacts, and do not represent a regulatory PSD Increment Consumption Analysis. Even though most of the development activities would occur within areas designated PSD Class II, the potential impacts on regional Class I areas are to be evaluated. The Montana DEQ will perform the required regulatory PSD increment analysis during the new sources review process. This formal regulatory process will include analysis of impacts on Class I and II air quality areas by existing and proposed emission sources. The activities are not allowed to cause incremental effects greater than the stringent Class I thresholds to occur inside any PSD Class I Area. Stringent emission controls (BACT – Best Available Control Technology) and emission limits may be stipulated in air quality permits as a result of this review, or a permit could be denied.

Sources subject to the PSD permit review procedure are also required to demonstrate potential impacts to air quality related values (AQRV). These include visibility impacts, degradation of mountain lakes from atmospheric deposition (acid rain), and effects on sensitive flora and fauna in the Class I areas. The CAA also provides specific visibility protection procedures for the mandatory federal Class I areas designated by the U.S. Congress on August 7, 1977, which included wilderness areas greater than 5,000 acres in size, and national parks and national memorial parks greater than 6,000 acres in size as of that date. The Fort Peck and Northern Cheyenne tribes have also designated their lands as PSD Class I, although the national visibility regulations do not apply in these areas. The allowable incremental impacts for $NO_2$, $PM_{10}$, and $SO_2$ within these PSD Class I areas are very limited. The remainder of the CBM emphasis area is designated PSD Class II with less stringent requirements.

## TABLE AQ-2
## AMBIENT AIR QUALITY MONITORING DATA COLLECTED BY THE NORTHERN CHEYENNE TRIBE (IN ($\mu$G/M$^3$)

| Pollutant | Averaging Time [a] | Year | Morningstar | Garfield Peak | Badger Peak | Lame Deer # 1 | Lame Deer # 2 | Lame Deer # 3 | Lame Deer "PM10A" | Lame Deer "TEOM" |
|---|---|---|---|---|---|---|---|---|---|---|
| **nitrogen dioxide** | Annual | 1996 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| | | 1997 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| | | 1998 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| | | 1999 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| | | 2000 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| **PM$_{10}$** | Annual | 1996 | 6 | N/A | N/A | 20 | N/A | N/A | N/A | N/A |
| | | 1997 | N/A | N/A | N/A | 18 | 26 | N/A | N/A | N/A |
| | | 1998 | N/A | N/A | N/A | 23 | 32 | 32 | N/A | N/A |
| | | 1999 | N/A | N/A | N/A | 19 | 33 | 32 | [22] [b] | 32 [b] |
| | | 2000 | N/A | N/A | N/A | 18 | 29 | N/A | 17 [b] | 28 [b] |
| | | 2001 | N/A | N/A | N/A | 16 | 36 | N/A | N/A | N/A |
| | 24-hours | 1996 | 19 | N/A | N/A | 120 | N/A | N/A | N/A | N/A |
| | | 1997 | N/A | N/A | N/A | 106 | 75 | N/A | N/A | N/A |
| | | 1998 | N/A | N/A | N/A | 55 | **153** | **153** | N/A | N/A |
| | | 1999 | N/A | N/A | N/A | 41 | 106 | 107 | [36] [b] | 93 [b] |
| | | 2000 | N/A | N/A | N/A | 40 | 124 | N/A | 39 [b] | 93 [b] |
| | | 2001 | N/A | N/A | N/A | 33 | 135 | N/A | N/A | N/A |

## TABLE AQ-2
## AMBIENT AIR QUALITY MONITORING DATA COLLECTED BY THE NORTHERN CHEYENNE TRIBE (IN ($\mu$G/M$^3$)

| Pollutant | Averaging Time [a] | Year | Morningstar | Garfield Peak | Badger Peak | Lame Deer # 1 | Lame Deer # 2 | Lame Deer # 3 | Lame Deer "PM10A" | Lame Deer "TEOM" |
|---|---|---|---|---|---|---|---|---|---|---|
| **sulfur dioxide** | Annual | 1996 | 2.7 | 2.7 | 2.7 | N/A | N/A | N/A | N/A | N/A |
| | | 1997 | 2.7 | 2.7 | 2.7 | N/A | N/A | N/A | N/A | N/A |
| | | 1998 | 2.7 | 2.7 | 2.7 | N/A | N/A | N/A | N/A | N/A |
| | | 1999 | 2.7 | 2.7 | 2.7 | N/A | N/A | N/A | N/A | N/A |
| | | 2000 | 2.7 | 2.7 | 2.7 | N/A | N/A | N/A | N/A | N/A |
| | 24-hours | 1996 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| | | 1997 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| | | 1998 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| | | 1999 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| | | 2000 | 5.7 | 5.7 | 5.7 | N/A | N/A | N/A | N/A | N/A |
| | 3-hours | 1996 | 5.2 | 7.8 | 5.2 | N/A | N/A | N/A | N/A | N/A |
| | | 1997 | 5.2 | 7.8 | 5.2 | N/A | N/A | N/A | N/A | N/A |
| | | 1998 | 10.4 | 10.4 | 10.4 | N/A | N/A | N/A | N/A | N/A |
| | | 1999 | 7.8 | 7.8 | 5.2 | N/A | N/A | N/A | N/A | N/A |
| | | 2000 | 5.2 | 5.2 | 5.2 | N/A | N/A | N/A | N/A | N/A |

Source: EPA (2002b)

Notes: $\mu$g/m$^3$ - micrograms per cubic meter

N/A - data not available

[a] Short-term averages are reported as the second maximum values.

[b] Supplemental data provided by (Littlewolf 2002).

[data] - data in brackets are not reliable due to the small number of samples collected.

# 4.0 Agency Roles and Authorities

## 4.1 Environmental Protection Agency

The Environmental Protection Agency (EPA) administers the Federal Clean Air Act (CAA), (42 U.S.C. 7401 et seq.) to maintain the National Ambient Air Quality Standards (NAAQS) that protect human health and to preserve the rural air quality in the region by assuring the Prevention of Significant Deterioration Class I and Class II increments for $SO_2$, $NO_2$, and $PM_{10}$, are not exceeded. EPA has delegated this CAA authority to the States of Montana and Wyoming.

Until the Tribes have an EPA-approved Tribal program, EPA will administer air quality requirements within Indian country. EPA is responsible for assuring that NAAQS are attained and that the Tribally-designated Northern Cheyenne Class I sensitive airshed is protected, as well as the Class II increment limits that apply on the Crow Reservation. EPA will implement an air permitting program for major sources within Indian country, including BACT analysis, where appropriate. At this time, there is no federal minor source permitting program. Therefore, EPA cannot regulate minor sources in Indian country directly unless EPA decides to implement a Federal Implementation Plan (FIP). Mitigation of particulate emissions from unimproved roads in Indian country may be necessary to protect the Class I and Class II $PM_{10}$ increments.

## 4.2 Montana DEQ

The MDEQ has been delegated Federal Clean Air Act (CAA) authority from the United States Environmental Protection Agency (EPA) to manage the New Source Review—Prevention of Significant Deterioration (PSD) permit program for listed major sources with the potential to emit (PTE) greater than 100 tons per year (tpy) of any regulated pollutant and all other sources with a PTE greater than 250 tpy of any regulated pollutant. Further, the MDEQ, under the Clean Air Act of Montana (MCA 75-2-101 et seq.) and the Administrative Rules of Montana (ARM) administers a minor source air quality permitting program for sources with a PTE greater than 25 tons per year unless otherwise noted in the ARM. This program requires, among other things, that Best Available Control Technology (BACT) apply to regulated air pollutant emission sources. MDEQ also has delegated responsibility to operate an approved ambient air quality monitoring network for the purpose of demonstrating compliance with the National and Montana Ambient Air Quality Standards (NAAQS/MAAQS).

Currently, the MDEQ imposes a minor source permit limitation on gas compressor engines on a permit-by-permit basis for sources exceeding the Montana minor source permitting threshold (ARM Chapter 17.8, Subchapter 7). Under the authority of ARM 17.8.715, Emission Control Requirements, the MDEQ establishes BACT on a case-by-case basis for natural gas compressor engines, such as those sources indicated for coal bed methane (CBM) development. In general, the Department has required $NO_2$ emission limits of around 2 grams per brake horsepower hour (g/bhp-hr), a CO emission limit of around 3 g/bhp-hr, and a volatile organic compound (VOC) emission limit of around 1 g/bhp-hr for these sources. Again, as part of the minor source permitting program, Montana applies pollutant specific BACT to compressor engines on a case-by-case basis with limits as described above. However, should future regulatory modeling indicate potential NAAQS/MAAQS or increment consumption exceedances, the MDEQ may require more stringent limits to protect applicable standards.

In addition to the applicable point source BACT emission limits described above, under the authority of ARM 17.8.308, the MDEQ requires that a permitted source use reasonable precautions to limit fugitive particulate emissions from haul roads, access roads, parking lots, or the general plant property. In general, the MDEQ requires that a source have fresh water and/or chemical dust suppressant available on site and used as necessary to maintain compliance with applicable limits, including, but not limited to, the reasonable precautions and opacity limits. Further, the MDEQ could establish more stringent BACT limits for permitted sources and require that counties apply BACM to unimproved roads or other control measures sufficient to avoid exceeding applicable standards and the Class I and Class II increment limits for $PM_{10}$. Further, the ARM establishes generally applicable air quality rules pertaining to all sources of air pollution, including sources not subject to air quality permitting. These rules include, but are not limited to, the requirements contained in ARM 17.8, Subchapter 1 and ARM 17.8, Subchapter 3.

## 4.3 Bureau of Indian Affairs

BIA is responsible for approval of any lease, agreement, permit, or document that could encumber lands and minerals owned by either Tribes or allottees. Under the Indian Mineral Development Act (IMDA), the Secretary of Interior is responsible, based upon BIA recommendation, for approving any contractual arrangement to develop CBM resources. Specific discussion of tribal air quality management issues are addressed separately.

## 4.4 Bureau of Land Management

NEPA requires that federal agencies consider mitigation of direct and cumulative impacts during their preparation of an EIS. (BLM Land Use Planning Manual 1601.) Under the CAA, federal agencies are to comply with State Implementation Plans regarding the control and abatement of air pollution. Prior to approval of Resource Management Plans (RMPs) or Amendments to RMPs, the State Director is to submit any known inconsistencies with State Implementation Plan (SIP) to the Governor of that state. If the Governor of the State recommends changes in the proposed RMP or Amendment to meet SIP requirements, the State Director shall provide the public an opportunity to comment on those recommendations. (BLM Land Use Planning Manual at Section 1610.3-2.)

## 4.5 Forest Service

The Forest Service administers nine wilderness areas (WAs) that could be affected by direct effects associated with project and non-project sources: Bridger WA; Fitzpatrick WA; North Absaroka, Absaroka-Beartooth, and Washakie WAs, next to Yellowstone NP; Teton WA; U.L. Bend WA; Cloud Peak WA; and Popo Agie WA with mandatory Class I designation. As federal land mangers, the Forest Service could act in a consultative role to stipulate that the BLM modeling results, or any future EPA or State-administered PSD refined modeling results (if justified), triggers adverse impairment status. Should the Forest Service determine impairment of WAs, then BLM, the State, and/or EPA may need to mitigate this predicted adverse air quality effect.

## 4.6 National Park Service

Three areas administered by the National Park Service—Yellowstone National Park, Devils Tower National Monument, and Bighorn Canyon National Recreation Area—could be affected by direct effects associated with project and non-project sources. (Note: Additional Park Service Class I and II areas may be impacted by the non-project sources evaluated, without significant impact from project sources.) As federal land mangers, the Park Service could act in a consultative role to stipulate that the BLM modeling results, or any future EPA or State-administered PSD refined modeling results (if justified), triggers adverse impairment status. Should the Park Service determine impairment of NPS-administered Class I areas, then BLM, the State, and/or EPA may need to mitigate this predicted adverse air quality effect.

# 5.0 Air Quality Management on Tribal Lands

The 1990 Clean Air Act (CAA) Amendments (Section 301(d)) provided tribes the authority to implement CAA programs for their reservations. The Tribal Authority Rule (TAR), promulgated February 12, 1998, reiterates that tribes have direct implementation authority for the CAA. However, until such time as the tribe assumes such responsibility to implement its own program, EPA must implement Federal air quality laws for them. The TAR also requires under §49.11 that EPA promulgate a Federal Implementation Plan (FIP) as necessary or appropriate to protect air quality on the reservations.

EPA has the authority to implement two permitting programs and three source specific programs. EPA has regulatory authority to issue pre-construction permits to major air pollution emissions sources under the Prevention of Significant Deterioration (PSD) program at 40 CFR part 52 and operating permits to major sources under the Title V program at 40 CFR part 71. The PSD program requires that subject sources conduct an air quality analysis to determine the impact on the National Ambient Air Quality Standards (NAAQS) and the PSD increments for $NO_2$, $SO_2$, and $PM_{10}$ for three different area classifications (Class I, Class II, and Class III). Under the PSD program, Class I status was assigned to pristine areas, such as national parks and forest lands. Several tribes have been redesignated from a Class II status to a Class I status. The rest of the country is Class II and there are no Class III areas. EPA also has regulatory authority to implement the New Source Performance Standards (NSPS) at 40 CFR part 60, the National Emission Standards for Hazardous Air Pollutants (NESHAP) at 40 CFR part 61, and the Maximum Achievable Control Technology (MACT) standards at 40 CFR part 63.

EPA does not have a rule for a minor source pre-construction permitting program for permitting new and modified sources. A minor source rule is being addressed by the Agency, but such a rule will not be final for 2-3 years. A minor source rule could give EPA the authority to implement a minor source Best Available Control Technology (BACT) requirement for engines. Nor does EPA have a FIP in place for Indian country to address measures for controlling fugitive dust or control technologies for engines.

In 1977, the Northern Cheyenne Indian Tribe's Reservation was redesignated as a Class I airshed under the PSD program. The Tribe has implemented an air quality monitoring program, delivering air quality data to AIRS-AQS since 1981. Currently, the Tribe does not have any EPA approved CAA programs for issuing permits, nor is there a Tribal Implementation Plan (TIP) with general source or source specific requirements or any of the federal NSPS, MACT, or NESHAP standards. At this time, if permitting of major air pollution sources was required, EPA would be the permitting authority.

The Crow Indian Reservation is a Class II airshed. Currently, the Tribe does not have any EPA approved CAA programs for issuing permits, nor is there a TIP with general source or source specific requirements, or any of the federal NSPS, MACT, or NESHAP standards. The Tribe was approved for a CAA Section 103 grant in 2001 to conduct an emissions inventory of the sources on the Reservation. The Tribe is not currently implementing an air quality monitoring program. At this time, if permitting of major air pollution sources were required, EPA would be the permitting authority.

The preferred method to determine the mitigation required to prevent exceedances of ambient air quality standards and to prevent significant deterioration is modeling. EPA will work with the states of Wyoming and Montana along with the tribes to see that, wherever possible, tribal air quality issues are addressed in regional modeling efforts related to coal bed methane development. Additional modeling efforts addressing specific tribal concerns, as necessary, can be undertaken by EPA and the tribal air quality agencies.

Ambient air monitoring can be used to augment and validate modeled results. The Northern Cheyenne Tribe currently conducts ambient air $PM_{10}$ and particulate matter with an aerodynamic diameter equal to or less than 2.5 microns ($PM_{2.5}$) monitoring in the Lame Deer $PM_{10}$ non-attainment area on the Northern Cheyenne Reservation. In order to track the impacts of nearby industrial activities on air quality, the tribe also conducts IMPROVE protocol speciated $PM_{2.5}$ monitoring at the Morningstar site, and $PM_{10}$, $SO_2$ and $NO_2$ monitoring at the Morningstar, Badger Peak and Garfield Peak monitoring stations. These monitoring stations also have collocated meteorological monitors. With updates to emission inventories as a result of coal bed methane development on or outside the Northern Cheyenne Reservation, the monitoring network may need revision or augmentation.

The Crow Tribe does not currently have an air monitoring program and has never had one that submitted data to AIRS-AQS. The Crow tribe has the same rights and potential capabilities as the Northern Cheyenne Tribe. If regional emission increases are sufficient to threaten the NAAQS or other relevant air quality standard on Crow lands, EPA would work with the tribe to encourage them to initiate monitoring activities. To this end, the Tribe can build the capability necessary to conduct ambient air quality monitoring. In the event the tribe chooses not to conduct monitoring, EPA can choose to conduct monitoring using either EPA personnel or contract assistance under Section 301 of the Clean Air Act.

In addition to point source emissions, fugitive dust controls for coal bed methane sources will likely be needed for development on tribal lands. The Tribes can use contractual relationships with developers to require necessary construction phase dust controls on wells on Tribal lands. EPA will work with Tribal, BIA and county agencies as needed to develop and implement necessary mitigation on unpaved roads used for development related traffic.

# 6.0 Air Quality Impact Assessment

As described in **Chapter 4, Environmental Consequences (Air Quality)**, an extensive air quality impact assessment technical support document was prepared by Argonne National Laboratory (Argonne 2002) and is available for review. Argonne analyzed potential impacts from: individual proposed Alternatives A, B/C/E, and D (project sources); "Non-project" emission sources (existing sources, RFFA and Wyoming PRBO&G Alternative 1; RFFA emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest; and all sources cumulatively by Alternative. Since Alternatives B, C and E have very similar emission inventories, a single air quality impact analysis represents all of these three Alternatives. For example, under Alternative C the number of wells connected to a field (booster) compressor would not be limited but the number was assumed to be the same as in Alternative B, and under Alternative E electrical field (booster) compressors would be required where noise is an issue although all compressors were assumed to be gas-fired.

The air quality impact assessment was based on the best available engineering data and assumptions, meteorology data, and dispersion modeling procedures, as well as professional and scientific judgment. However, where specific data or procedures were not available, reasonable assumptions were made. Note that these assumptions could result in under or over-estimates of impacts. It is difficult to ascertain the overall bias of the emission estimates and modeling; no sensitivity or probabilities of occurrence analyses were performed.

Air quality impacts for various air pollutants are determined by the use of air dispersion models using specific source emission rates. For natural gas compressors, the emissions of nitrogen oxides are determined by the assumed permitted emission rate allowed by the state. For fugitive dust impacts, emission rates are obtained from EPA's AP-42 document that is titled "Compilation of Air Pollutant Emission Factors". An AP-42 emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Emission factors may be appropriate to use in a number of situations such as making source-specific emission estimates for area-wide inventories. These inventories have many purposes including ambient dispersion modeling and analysis, control strategy development, and in screening sources for compliance investigations. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all sources in a specific category.

Potential air pollutant emissions from the proposed Alternatives emission sources (denoted as "project" sources) were calculated separately to determine potential impacts. These emissions were then combined with existing sources, proposed non-PRBO&G developments and reasonably foreseeable future actions (RFFA) emissions (denoted as "non-project" sources) and RFFA emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest to determine the total potential cumulative air quality impacts. All of the tables in this Air Quality Modeling Appendix display impacts from: 1) the project sources only; 2) the project sources combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest (denoted as "Project + RFFA Sources ); 3) the non-project sources; and 4) cumulative totals.

The non-project sources include development permitted: 1) by the MDEQ; 2) by the WYDEQ; and 3) within the states of North Dakota, South Dakota, and Nebraska; and projections for the Wyoming Powder River Basin Oil and Gas Project DEIS Alternative sources (BLM 2002a); and other RFFA sources from states within the geographic area covered by the model.

Potential direct, indirect and cumulative air quality impacts were analyzed and reported solely under the requirements of NEPA, in order to assess and disclose reasonably foreseeable impacts to both the public and the BLM decision maker before a Record of Decision is issued. Due to the preliminary nature of this NEPA analysis, it should be considered a reasonable estimate of predicted impacts. Actual impacts at the time of development (subject to air pollutant emission source permitting) could be different. To the extent that impacts are predicted to be greater than regulatory thresholds, appropriate mitigation efforts would be undertaken.

Given the lack of representative wind measurements throughout the CBM emphasis area, the EPA CALPUFF dispersion model was used with regional wind speed and direction values derived from the 1996 MM5 (mesoscale model) and CALMET meteorological models (Argonne 2002). Meteorological information was assembled to characterize atmospheric transport and dispersion from several 1996 data sources, including: 36 km gridded MM5 (mesoscale model) values with continuous four-dimensional data assimilation; and hourly surface observations (wind speed, wind direction, temperature, cloud cover, ceiling height, surface pressure, relative humidity, and precipitation.)

Potential air quality impacts were predicted using the EPA CALPUFF dispersion model. The meteorology data and air pollutant emission values were combined to predict maximum potential direct, indirect, and cumulative near-field air quality impacts in the vicinity of assumed well and compressor engine emission sources for comparison with applicable air quality standards and PSD Class II increments. Maximum potential near-field particulate matter emissions from traffic on unpaved roads and during well pad construction were used to predict the maximum annual and 24-hour average $PM_{2.5}$, $PM_{10}$, and $SO_2$ impacts. Maximum air pollutant emissions from each CBM well would be temporary (i.e., occurring during a 12-day construction period) and would occur in isolation, without significantly interacting with adjacent well locations. Particulate matter emissions from well pad and resource road construction would be minimized by application of water and/or chemical dust suppressants. The control efficiency of these dust suppressants was computed at 50 per cent during construction. During well completion testing, natural gas could be burned (flared) up to 24 hours.

Air pollutant dispersion modeling was also performed to quantify CO, $NO_2$, $PM_{2.5}$, $PM_{10}$, and HAP impacts during operation. Operation emissions would primarily occur due to increased compression requirements, including field (booster) and sales (pipeline) compressor stations. Since produced natural gas is nearly pure methane, with little or no liquid hydrocarbons or sulfur compounds, direct VOC emissions or objectionable odors are not likely to occur. HAP impacts were predicted based on an assumed 9,900 horsepower, six-unit, reciprocating compressor engine station operating at full load with emissions generated by a single stack.

The significance criteria for potential air quality impacts include local, state, tribal and federally enforced legal requirements to ensure air pollutant concentrations will remain within specific allowable levels. These requirements and legal limits were presented in Table AQ-1. Where legal limits have not been established, the BLM uses the best available scientific information to identify thresholds of significant adverse impacts. Thresholds have been identified for hazardous air pollutant (HAP) exposure, potential acid neutralizing capacity (ANC) changes to sensitive lake water chemistry, and a 1.0 dv "just noticeable change" in potential visibility impacts.

Since neither the MDEQ nor EPA have established HAP standards, predicted 8-hour HAP concentrations were compared to a range of 8-hour state maximum Acceptable Ambient Concentration Levels (EPA 1997a). Pollutants which were predicted to exceed these state threshold levels were also analyzed to determine the possible incremental cancer-risk for a most likely exposure (MLE) to residents, and to a maximally exposed individual (MEI), such as compressor station workers. These cancer risks were calculated based on the maximum predicted annual concentrations, EPA's unit risk factors for carcinogenic compounds (EPA 1997b), and an adjustment for time spent at home or on the job.

The EPA CALPUFF dispersion model was also used to determine maximum far-field ambient air quality impacts at downwind mandatory federal PSD Class I areas, and other sensitive receptors, to: 1) determine if the PSD Class I increments might be exceeded; 2) calculate potential total sulfur and nitrogen deposition, and their related impacts to in sensitive lakes; and 3) predict potential visibility impacts (regional haze) within distant sensitive receptors.

Several lakes within five FS designated wilderness areas were identified as being sensitive to atmospheric deposition and for which the most recent and complete data have been collected. The FS (Fox et al. 1989) has identified the following total deposition (wet plus dry) thresholds below which no adverse impacts are likely: five kg/ha-yr for sulfur, and three kg/ha-yr for nitrogen. The FS (2000) has also developed a screening method which identifies the following Limit of Acceptable Change regarding potential changes in lake chemistry: no more than a ten per cent change in ANC for those water bodies where the existing ANC is at or above 25 μeq/l, and no more than a one μeq/l change for those extremely sensitive water bodies where the existing ANC is below 25 μeq/l. No sensitive lakes were identified by either the NPS or FWS.

Since the potential air pollutant emission sources constitute many small sources spread out over a very large area, discrete visible plumes are not likely to impact the distant sensitive areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze degradation is caused by fine particles and gases scattering and absorbing light. Potential changes to regional haze are calculated in terms of a perceptible "just noticeable change" (1.0 dv) in visibility when compared to background conditions. A 1.0 dv change is considered potentially significant in mandatory federal PSD Class I areas as described in the EPA Regional Haze Regulations (40 CFR 51.300 et seq.), and as originally presented in Pitchford and Malm (1994). A 1.0 dv change is defined as about a ten per cent change in the extinction coefficient (corresponding to a two to five per cent change in contrast, for black target against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory federal Class I areas.

It should be noted that a 1.0 dv change is not a "just noticeable change" in all cases for all scenes. Visibility changes less than 1.0 dv are likely to be perceptible in some cases, especially where the scene being viewed is highly sensitive to small amounts of pollution, such as due to preferential forward light scattering. Under other view-specific conditions, such as where the sight path to a scenic feature is less than the maximum visual range, a change greater than 1.0 dv might be required to be a "just noticeable change." However, this NEPA analysis is not designed to predict specific visibility impacts for specific views in specific mandatory federal PSD Class I areas based on specific project designs, but to characterize reasonably foreseeable visibility conditions that are representative of a fairly broad geographic region, based on reasonable emission source assumptions. This approach is consistent with both the nature of regional haze and the requirements of NEPA. At the time of a pre-construction air quality permit review, the applicable air quality regulatory agency may require a much more detailed visibility impact analysis. Factors such as the magnitude of change, frequency, time of the year, and the meteorological conditions during times when predicted visibility impacts are above the 1.0 dv threshold (as well as inherent conservatism in the modeling analyses) should all be considered when assessing the significance of predicted impacts.

The FS, NPS and FWS have published their "Final FLAG Phase I Report" (Federal Register, Vol. 66 No. 2, dated January 3, 2001), providing "a consistent and predictable process for assessing the impacts of new and existing sources on AQRVs" including visibility. For example, the FLAG report states "A cumulative effects analysis of new growth (defined as all PSD increment-consuming sources) on visibility impairment should be performed," and further, "If the visibility impairment from the proposed action, in combination with cumulative new source growth, is less than a change in extinction of 10% [1.0 dv] for all time periods, the Federal Land Managers (FLM) will not likely object to the proposed action."

The FLAG report also recommends a two-step analysis process to evaluate potential visibility impacts from either a single proposed air pollutant emission source (the seasonal FLAG screening method) or potential cumulative visibility impacts from a group of air pollutant emission sources (the daily FLAG refined method). As described in Argonne (2002), this NEPA analysis first used the seasonal FLAG screening method (based on both the FLAG and WYDEQ-AQD "natural background" reference levels) to exclude those sensitive areas where visibility impacts were not likely to occur. Since no areas were excluded using the seasonal FLAG screening method, this NEPA analysis then applied the daily FLAG refined method (based on hourly background optical extinction and relative humidity values measured in both the Badlands and Bridger wilderness areas between 1989 and 1999) to determine the average number of days a 1.0 dv "just noticeable change" would be reached annually in each sensitive area. Although the use of observed hourly optical extinction and relative humidity values is appropriate in this NEPA analysis (where the potential visibility impacts are predicted to occur under the Alternatives based on the reasonably foreseeable background conditions), EPA's Regional Haze Regulations are based on optical conditions reconstructed from $PM_{2.5}$ and $PM_{10}$ data collected every third day under the IMPROVE program.

# 7.0 Modeling Assumptions

When reviewing the predicted near- and far-field air quality impacts, it is important to understand that assumptions were made regarding development, emissions, meteorology, atmospheric transport and chemistry, and atmospheric deposition. For example, there is uncertainty regarding ultimate development (i.e., number of wells, equipment to be used, specific locations of wells, etc.).

The following assumptions were used in the analysis:

- Total predicted short-term air pollutant impact concentrations were assumed to be the sum of the assumed background concentration, plus the predicted maximum cumulative modeled concentrations, which may occur under different meteorological conditions.
- Assumed background air pollution concentrations were assumed to occur throughout the 20-year life of project (LOP) at all locations in the region, even though monitoring is primarily conducted in urban or industrial areas, rather than rural areas. The uniform background $PM_{10}$ levels for each state are assumed to be representative of the background conditions for the entire modeled area of the PRB, based on monitoring data gathered throughout northeastern Wyoming and southeastern Montana.
- The maximum predicted air quality impacts occur only in the vicinity of the anticipated emission sources. Actual impacts would likely be less at distances beyond the predicted points of maximum impact.
- All emission sources were assumed to operate at their reasonably foreseeable maximum emission rates simultaneously throughout the LOP. Given the number of sources included in this analysis, the probability of such a scenario actually occurring over an entire year is small.
- In developing the emissions inventory and model, there is uncertainty regarding ultimate development (i.e., number of wells, equipment to be used, specific locations, etc.) Most (90 per cent) proposed CBM wells and 30 per cent of conventional wells were assumed to be fully operational and remain operating (no shut ins) throughout the LOP.
- The total proposed booster (field) and pipeline (sales) compression engines were assumed to operate at their rated capacities continuously throughout the LOP (no phased increases or

reductions). In reality, compression equipment would be added or removed incrementally as required by the well field operation, compressor engines would operate below full horsepower ratings, and it is unlikely all compressor stations would operate at maximum levels simultaneously.

- The HAP analyses assumed a six-unit, 1,650 hp each, reciprocating compressor engine station would operate at full load and at maximum emission levels continuously throughout the LOP.
- The emissions inventory and model use peak years of construction and peak years of operations, which would not occur throughout the entire development region at the same time. However, these conditions may occur in some areas.
- The emissions inventory and model assumed that a reasonably foreseeable emission rate for compressor engines of 1.5 g/hp-hr of nitrogen oxides ($NO_x$)is achievable in Montana. Since BACT is decided on a case-by-case basis, actual emission rates could be decided to be less or more than this level by the Departments of Environmental Quality in Montana or Wyoming, and on Indian lands by EPA, for field and sales compressor engines. Reasonable $NO_x$ emission rates may range from 0.7 to 2 g/hp-hr.
- There are no applicable local, state, tribal or federal acid deposition standards. In the absence of applicable standards, the acid deposition analysis assumed that a "limit of acceptable change" is: a 10 per cent change in acid neutralizing capacity (ANC) for lakes with a background ANC greater than 25 μeq/l; or a 1 μeq/l change in ANC for lakes with a background ANC less than 25 μeq/l, and would be a reasonably foreseeable significant adverse impact. Further, the atmospheric deposition impact analysis assumed no other ecosystem components would affect lake chemistry for a full year (assuming no chemical buffering due to interaction with vegetation or soil materials).
- The visibility impact analysis assumed that a 1.0 dv "just noticeable change" would be a reasonably foreseeable significant adverse impact, although there are no applicable local, state, tribal or federal regulatory visibility standards. However, some FLMs are using 0.5 dv as a screening threshold for significance.
- Mitigation measures are included in the emissions inventory and model that may not be achievable in all circumstances. However, actual mitigation decided by the developers and local and state authorities may be greater or less than those assumed in the analysis. For example, maintaining a construction road speed limit of 15 mph may be reasonable in a construction zone but difficult to enforce elsewhere. Full (100%) mitigation of fugitive dust from disturbed lands may not be achievable. Further, 50% reduction in fugitive emissions is assumed based on construction road wetting on the unimproved access road to the pad and at the pad, but this level of effectiveness is characterized as the maximum possible. In the air quality modeling, no specific road wetting or other emissions controls were assumed to be used during the operations phase of the development (e.g., for maintenance vehicle traffic). However, during the review of proposed projects (Applications for Permit to Drill) the BLM would require specific mitigation measures in certain areas during the operational phase of development.
- Induced or secondary growth related to increases in vehicle miles traveled (VMT) (believed to be on the order of 10 per cent overall) is not included in the emissions inventory and model. Not all fugitive dust emissions (including county and other collector roads) have been included in the emissions inventory and model.
- Fugitive dust emissions from roads are treated as area sources rather than line sources in the model, which may thereby reduce or increase the predicted ambient concentrations at maximum concentration receptor points near the source, depending on the inputs to the model (meteorology, terrain, etc.) By not placing modeled receptors close to emission sources (e.g. wells and roads), the model may not capture higher ambient concentrations near these sources. A more refined, regulatory model may yield higher concentrations at locations near fugitive dust sources.
- For comparisons to the PSD Class I and II increments, the emissions inventory and model included only CBM and RFFA sources. Other existing increment consuming sources such as Campbell County, Wyoming coal mines were not included in this comparison, as the air quality analysis does not represent a regulatory PSD increment consumption analysis. A regulatory PSD increment consumption analysis needs to identify and consider all PSD increment consuming sources to determine the level of PSD Class II increment consumption. Monitoring data in Wyoming has indicated an upward trend in PM concentrations in Campbell County since 1999,

which coincides with CBM development but is also exacerbated by prolonged drought in the region.

It is important to note that before actual development could occur, the applicable air quality regulatory agencies (including the state, tribe or EPA) would review specific air pollutant emissions pre-construction permit applications that examine potential project-specific air quality impacts for some source categories. As part of these permit reviews (depending on source size), the air quality regulatory agencies could require additional air quality impact analyses or mitigation measures. Thus, before development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality.

# 8.0 Modeling Results

The following Tables present the detailed atmospheric dispersion modeling results which are summarized in **Chapter 4, Environmental Consequences (Air Quality)**.

**TABLE AQ-3**

**PREDICTED HAZARDOUS AIR POLLUTANT IMPACTS AND SIGNIFICANCE THRESHOLDS (IN (μG/M$^3$)**

| Pollutant | Averaging Time | Direct Modeled Impact | Range of State Acceptable Ambient Concentration Levels |
|---|---|---|---|
| formaldehyde | 8-hours | **11.9** | **4.5** (FL07) - 71 (NV01) |
| n-hexane | 8-hours | 0.6 | 1,800 (FL07) - 36,000 (CT01) |
| benzene | 8-hours | 0.7 | 30 (FL04) - 714 (NV01) |
| toluene | 8-hours | 4.6 | 1,870 (IN03) - 8,930 (NV01) |
| ethyl benzene | 8-hours | < 0.1 | 4,340 (ND01) - 43,500 (VT01) |
| xylene | 8-hours | 0.2 | 2,170 (IN01) - 10,400 (NV01) |

Source: Argonne (2002)

Agencies: CT01 - Connecticut Department of Environmental Protection; Air Compliance Unit
FL04 - Broward County Department of Natural Resource Protection (Florida)
FL07 - Pinellas County Air Pollution Control Board (Florida)
IN01 - Indiana Department of Environmental Management
IN03 - Indianapolis Air Pollution Control Division (Indiana)
ND01 - North Dakota Dept. of Health; Division of Environmental Engineering
NV01 - Nevada Division of Environmental Protection; Air Quality Control
VT01 - Vermont Dept. of Environmental Conservation; Air Pollution Control Division

## TABLE AQ-4
## ALTERNATIVE A—PREDICTED CRITERIA POLLUTANT IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS (IN (μG/M$^3$)

| Pollutant | Avg Time[a] | Location | PSD Increment | Alt A Project | Non-Project | Cum | Background | Total | NAAQS | MAAQS |
|---|---|---|---|---|---|---|---|---|---|---|
| **carbon monoxide** | 1-hour | near-field | - - - | 49 | 540 | 540 | 15,000 | 15,540 | 40,000 | 26,000 |
| | | far-field[1] | - - - | 1 | 100 | 100 | 15,000 | 15,100 | 40,000 | 26,000 |
| | 8-hours | near-field | - - - | 30 | 311 | 314 | 6,600 | 6,914 | 10,000 | 10,000 |
| | | far-field[1] | - - - | <1 | 52 | 52 | 6,600 | 6,652 | 10,000 | 10,000 |
| **nitrogen dioxide** | 1-hour | near-field | - - - | 21 | 181 | 187 | 117 | 304 | - - - | 566 |
| | | far-field[1] | - - - | 2.0 | 36 | 36 | 117 | 153 | - - - | 566 |
| | Annual | near-field | 25 | 1.9 | 4.8 | 6.0 | 11 | 17 | 100 | 100 |
| | | far-field[3] | 25 | 1.2 | 1.1 | 2.0 | 11 | 13 | 100 | 100 |
| | | far-field[2] | 2.5 | 0.2 | 0.5 | 0.7 | 11 | 12 | 100 | 100 |
| **$PM_{2.5}$** | 24-hours | near-field | - - - | 1.0 | 44.1 | 44.4 | 20 | 64 | 65 | - - - |
| | | far-field[4] | - - - | 0.1 | 12.7 | 12.7 | 20 | 33 | 65 | - - - |
| | Annual | near-field | - - - | 0.3 | 5.6 | 5.8 | 8 | 14 | 15 | - - - |
| | | far-field[4] | - - - | 0.0 | 1.2 | 1.2 | 8 | 9 | 15 | - - - |
| **$PM_{10}$** | 24-hours | near-field | **30**[b] | 1.8 | **104**[b] | **105**[b] | 105 | **210**[c] | **150**[c] | **150**[c] |
| | | far-field[4] | 30 | 0.1 | 29.7 | 29.7 | 105 | 135 | 150 | 150 |
| | | far-field[2] | **8**[b] | 0.5 | **8.4**[b] | **8.7**[b] | 105 | 114 | 150 | 150 |
| | | far-field[5] | 8 | 0.2 | 7.2 | 7.4 | 105 | 112 | 150 | 150 |
| | Annual | near-field | 17 | 0.5 | 13.1 | 13.4 | 30 | 43 | 50 | 50 |
| | | far-field[4] | 17 | 0.0 | 2.7 | 2.7 | 30 | 33 | 50 | 50 |
| **sulfur dioxide** | 1-hour | near-field | - - - | 1.9 | 27.4 | 28.0 | 666 | 694 | - - - | 1,300 |
| | | far-field[3] | - - - | 1.2 | 29.6 | 29.6 | 666 | 696 | - - - | 1,300 |
| | 3-hours | near-field | 512 | 1.5 | 22.6 | 23.3 | 291 | 314 | 1,300 | - - - |
| | | far-field[3] | 512 | 1.0 | 17.1 | 17.1 | 291 | 308 | 1,300 | - - - |
| | 24-hours | near-field | 91 | 0.9 | 9.8 | 10.2 | 73 | 83 | 365 | 260 |
| | | far-field[3] | 91 | 0.6 | 5.3 | 5.3 | 73 | 78 | 365 | 260 |
| | Annual | near-field | 20 | 0.3 | 1.0 | 1.1 | 16 | 17 | 80 | 60 |
| | | far-field[3] | 20 | 0.2 | 0.4 | 0.4 | 16 | 16 | 80 | 60 |

Source: Argonne (2002)

Notes:

[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

[b] It is possible that Non-Project and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation, as well as the PSD Class II increment near the maximum assumed development; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate air quality regulatory agency.

[c] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 105 μg/m$^2$ were predicted to exceed the National and Montana ambient air quality standards due to Non-Project and **Cum** emission sources.

**Alt A** Project - Direct modeled Alternative A project sources impacts.
**Non-Project** - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt A**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.
**Cum** - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt A** Project and Non-Project impacts, which can occur at different locations.
**Total** - The sum of the cumulative modeled impact and the assumed background concentration.
**NAAQS** - Applicable National Ambient Air Quality Standard.
**MAAQS** - Applicable Montana Ambient Air Quality Standard.

Locations:
**1** – Absaroka-Beartooth Wilderness Area
**2** – Northern Cheyenne Indian Reservation
**3** – Crow Indian Reservation
**4** – Fort Belknap Indian Reservation
**5** – Washakie Wilderness Area

## TABLE AQ-5
## ALTERNATIVE A - PREDICTED ATMOSPHERIC DEPOSITION IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS

| | | | **Total Sulfur Deposition (kg/ha-yr)** | | | | **Total Nitrogen Deposition (kg/ha-yr)** | | | | **Acid Neutralizing Capacity (per cent)** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **PSD Class** | **Lake** | **Alt A Project** | **Non-Project** | **Cum** | **Thld** | **Alt A Project** | **Non-Project** | **Cum** | **Thld** | **Bkgd (µeq/l)** | **Alt A Project** | **Non-Project** | **Cum** | **Thld** |
| **Bridger WA** | I | Black Joe | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.03 | 0.03 | 3 | 69.0 | 0.1 | 2.2 | 2.3 | 10 |
| | | Deep | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.03 | 0.03 | 3 | 61.0 | 0.1 | 2.5 | 2.6 | 10 |
| | | Hobbs | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.02 | 0.02 | 3 | 68.0 | <0.1 | 1.2 | 1.3 | 10 |
| | | Upper Frozen | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.03 | 0.03 | 3 | 5.8 | <0.1[a] | **1.6**[a] | **1.6**[a] | **1**[a] |
| **Fitzpatrick WA** | I | Ross | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.02 | 0.02 | 3 | 61.4 | 0.1 | 1.7 | 1.7 | 10 |
| **Absaroka-Beartooth WA** | II | Stepping Stone | <0.01 | 0.02 | 0.02 | 5 | <0.01 | 0.02 | 0.03 | 3 | 27.0 | 0.1 | 2.0 | 2.1 | 10 |
| | | Twin Island | <0.01 | 0.01 | 0.02 | 5 | <0.01 | 0.02 | 0.03 | 3 | 36.0 | 0.1 | 1.4 | 1.5 | 10 |
| **Cloud Peak WA** | II | Emerald | <0.01 | 0.03 | 0.03 | 5 | <0.01 | 0.07 | 0.08 | 3 | 53.3 | 0.2 | 4.4 | 4.6 | 10 |
| | | Florence | <0.01 | 0.03 | 0.03 | 5 | <0.01 | 0.08 | 0.08 | 3 | 32.7 | 0.3 | 8.1 | 8.4 | 10 |
| **Popo Agie WA** | II | Lower Saddlebag | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.03 | 0.03 | 3 | 55.5 | 0.1 | 3.2 | 3.2 | 10 |

Source: Argonne (2002)

Notes: **Alt A** Project - Direct modeled Alternative A impacts.

**Non-Project** - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt A**, including the Wyoming “Powder River Basin Oil and Gas Project” DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.

**Cum** – Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt A Project** and **Non-Project** impacts. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

**Thld** – Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from FS (2000).

**WA** – Wilderness Area.

**a** - Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/l, the applicable significance threshold is less than a 1 µeq/l change. This threshold is exceeded by Non-Project and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

### TABLE AQ-6
### ALTERNATIVE A—DAILY FLAG REFINED METHOD—VISIBILITY IMPACT ANALYSIS
### (NUMBER OF DAYS Δ1.0 DV PER YEAR)

| Sensitive Location | PSD Classification | Alt A Project | Non-Project | Cum |
|---|---|---|---|---|
| Badlands WA | mandatory federal Class I | 0 | 17 to 25 | 18 to 25 |
| Bridger WA | mandatory federal Class I | 0 | 8 to 10 | 8 to 10 |
| Fitzpatrick WA | mandatory federal Class I | 0 | 7 to 9 | 8 to 10 |
| Gates of the Mountains WA | mandatory federal Class I | 0 | 3 to 4 | 3 to 4 |
| Grand Teton NP | mandatory federal Class I | 0 | 4 to 6 | 4 to 6 |
| North Absaroka WA | mandatory federal Class I | 0 | 10 to 12 | 11 to 12 |
| Red Rock Lakes WA | mandatory federal Class I | 0 | 0 to 1 | 0 to 1 |
| Scapegoat WA | mandatory federal Class I | 0 | 2 to 2 | 2 to 3 |
| Teton WA | mandatory federal Class I | 0 | 7 to 9 | 7 to 10 |
| Theodore Roosevelt NP (North Unit) | mandatory federal Class I | 0 | 1 to 2 | 1 to 2 |
| Theodore Roosevelt NP (South Unit) | mandatory federal Class I | 0 | 2 to 4 | 2 to 4 |
| U.L. Bend WA | mandatory federal Class I | 0 | 5 to 5 | 5 to 6 |
| Washakie WA | mandatory federal Class I | 0 | 11 to 14 | 12 to 15 |
| Wind Cave NP | mandatory federal Class I | 0 | 21 to 27 | 22 to 28 |
| Yellowstone NP | mandatory federal Class I | 0 | 9 to 11 | 9 to 11 |
| | | | | |
| Fort Peck IR | Tribal designated Class I | 0 | 1 to 2 | 2 to 2 |
| Northern Cheyenne IR | Tribal designated Class I | 0 | 30 to 38 | 33 to 42 |
| | | | | |
| Absaroka-Beartooth WA | federal Class II | 0 | 28 to 29 | 28 to 30 |
| Agate Fossil Beds NM | federal Class II | 0 | 10 to 15 | 10 to 15 |
| Bighorn Canyon NRA | federal Class II | 0 | 19 to 21 | 19 to 23 |
| Black Elk WA | federal Class II | 0 | 20 to 26 | 20 to 26 |
| Cloud Peak WA | federal Class II | 0 | 21 to 28 | 23 to 30 |
| Crow IR | federal Class II | 2 | 56 to 61 | 65 to 69 |
| Devils Tower NM | federal Class II | 0 | 24 to 38 | 26 to 39 |
| Fort Belknap IR | federal Class II | 0 | 60 to 61 | 61 to 61 |
| Fort Laramie NHS | federal Class II | 0 | 13 to 17 | 13 to 17 |

### TABLE AQ-6
### ALTERNATIVE A—DAILY FLAG REFINED METHOD—VISIBILITY IMPACT ANALYSIS (NUMBER OF DAYS Δ1.0 DV PER YEAR)

| Sensitive Location | PSD Classification | Alt A Project | Non-Project | Cum |
|---|---|---|---|---|
| Jewel Cave NM | federal Class II | 0 | 24 to 31 | 24 to 32 |
| Mount Rushmore NMem | federal Class II | 0 | 17 to 22 | 17 to 22 |
| Popo Agie WA | federal Class II | 0 | 8 to 10 | 8 to 10 |
| Soldier Creek WA | federal Class II | 0 | 13 to 18 | 13 to 18 |

Source: Argonne (2002)

Notes: **Alt A** Project - Direct modeled Alternative 1 impacts.

**Non-Project** - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt A**, including the Wyoming “Powder River Basin Oil and Gas Project” DEIS sources. The range of values corresponds to including Wyoming Alternative 3 (low) to Wyoming Alternative 1 (high).

**Cum** - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt A** Project and Non-Project impacts, which can occur at different locations. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

Locations:

**IR** - Indian Reservation.
**NHS** - National Historic Site.
**NM** - National Monument
**NMem** - National Memorial.
**NP** - National Park.
**NRA** - National Recreation Area
**WA** - Wilderness Area.

### TABLE AQ-7
### ALTERNATIVES B/C/E - PREDICTED CRITERIA POLLUTANT IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS (IN ($\mu$G/M$^3$)

| Pollutant | Avg Time [a] | Location | PSD Increment | Alts B/C/E Project | Alts B/C/E Project + RFFA | Non-Project | Cum | Back-ground | Total | NAAQS | MAAQS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **carbon monoxide** | 1-hour | near-field | - - - | 109 | 112.6 | 540.0 | 548.2 | 15,000 | 15,548 | 40,000 | 26,000 |
| | | far-field [1] | - - - | 6 | 7.3 | 100.0 | 100.0 | 15,000 | 15,100 | 40,000 | 26,000 |
| | 8-hours | near-field | - - - | 74 | 77.2 | 311.3 | 337.2 | 6,600 | 6,937 | 10,000 | 10,000 |
| | | far-field [2] | - - - | 56 | 57.8 | 28.9 | 78.0 | 6,600 | 6,677 | 10,000 | 10,000 |
| **nitrogen dioxide** | 1-hour | near-field | - - - | 100 | 102.3 | 181.0 | 207.3 | 117 | 324.3 | - - - | 566 |
| | | far-field [3] | - - - | 58 | 60.1 | 27.5 | 73.3 | 117 | 190.3 | - - - | 566 |
| | Annual | near-field | 25 | 9.1 | 9.4 | 4.8 | 10.7 | 11 | 21.7 | 100 | 100 |
| | | far-field [3] | 25 | 3.9 | 4.7 | 1.1 | 5.4 | 11 | 16.4 | 100 | 100 |
| | | far-field [2] | **2.5[c]** | 1.9 | **3.7[c]** | 0.5 | **4.2[c]** | 11 | 15.2 | 100 | 100 |
| **$PM_{2.5}$** | 24-hours | near-field | - - - | 6.2 | 6.9 | 44.1 | 45.9 | 20 | **65.9 [b]** | **65 [b]** | - - - |
| | | far-field [3] | - - - | 4.2 | 5.1 | 10.6 | 14.7 | 20 | 34.7 | 65 | - - - |
| | Annual | near-field | - - - | 1.4 | 1.5 | 5.6 | 6.3 | 8 | 14.3 | 15 | - - - |
| | | far-field [3] | - - - | 0.7 | 0.8 | 0.5 | 1.2 | 8 | 9.2 | 15 | - - - |
| **$PM_{10}$** | 24-hours | near-field | **30 [c]** | 12.1 | 13.1 | **103.8 [c]** | **107.1 [c]** | 105 | **212.1 [d]** | **150 [d]** | **150 [d]** |
| | | far-field [4] | 30 | 0.3 | 0.4 | 29.7 | 29.7 | 105 | 134.7 | 150 | 150 |
| | | far-field [2] | **8 [c]** | 4.2 | 5.9 | **8.4 [c]** | **12.8 [c]** | 105 | 117.8 | 150 | 150 |
| | | far-field [5] | **8 [c]** | 1.4 | 2.0 | 7.2 | **9.2 [c]** | 105 | 114.2 | 150 | 150 |
| | Annual | near-field | 17 | 3.6 | 3.7 | 13.1 | 14.3 | 30 | 44.3 | 50 | 50 |
| | | far-field [4] | 17 | <0.1 | <0.1 | 2.7 | 2.7 | 30 | 32.7 | 50 | 50 |
| **sulfur dioxide** | 1-hour | near-field | - - - | 4.6 | 4.6 | 27.4 | 28.2 | 666 | 694.2 | - - - | 1,300 |
| | | far-field [3] | - - - | 2.2 | 2.2 | 29.6 | 29.6 | 666 | 695.6 | - - - | 1,300 |
| | 3-hours | near-field | 512 | 3.5 | 3.5 | 22.6 | 23.6 | 291 | 314.6 | 1,300 | - - - |
| | | far-field [3] | 512 | 1.7 | 1.8 | 17.1 | 17.1 | 291 | 308.1 | 1,300 | - - - |
| | 24-hours | near-field | 91 | 2.1 | 2.1 | 9.8 | 10.5 | 73 | 83.5 | 365 | 260 |
| | | far-field [3] | 91 | 1.0 | 1.1 | 5.3 | 5.3 | 73 | 78.3 | 365 | 260 |
| | Annual | near-field | 20 | 0.7 | 0.7 | 1.0 | 1.2 | 16 | 17.2 | 80 | 60 |
| | | far-field [3] | 20 | 0.3 | 0.3 | 0.4 | 0.4 | 16 | 16.4 | 80 | 60 |

Source: Argonne (2002)

Notes:

[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

[b] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 20 $\mu g/m^2$ were predicted to exceed the National ambient air quality standards due to **Cum** emission sources.

[c] It is possible that **Alts B/C/E Project + RFFA**, Non-Project and/or **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation and the Washakie Wilderness Area, as well as the PSD Class II increment near the maximum assumed development; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate air quality regulatory agency.

[d] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 105 $\mu g/m^2$ were predicted to exceed the National and Montana ambient air quality standards due to Non-Project and **Cum** emission sources.

**Alts B/C/E** Project - Direct modeled Alternatives' B/C/E impacts.
**Alts B/C/E Project + RFFA** - Direct modeled Alternatives' B/C/E impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.
**Non-Project** – Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alts B/C/E**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.
**Cum** – Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alts B/C/E** Project and Non-Project impacts, which can occur at different locations.
**Total** - The sum of the cumulative modeled impact and the assumed background concentration.
**NAAQS** – Applicable National Ambient Air Quality Standard.
**MAAQS** – Applicable Montana Ambient Air Quality Standard.

Locations:
**1** – Absaroka-Beartooth Wilderness Area
**2** – Northern Cheyenne Indian Reservation
**3** – Crow Indian Reservation
**4** – Fort Belknap Indian Reservation
**5** – Washakie Wilderness Area

## TABLE AQ-8
## ALTERNATIVES B/C/E - PREDICTED ATMOSPHERIC DEPOSITION IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS

| | | | **Total Sulfur Deposition (kg/ha-yr)** | | | | | **Total Nitrogen Deposition (kg/ha-yr)** | | | | | **Acid Neutralizing Capacity (per cent)** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **PSD Class** | **Lake** | **Alts B/C/E Project** | **Alts B/C/E Project + RFFA** | **Non-Project** | **Cum** | **Thld** | **Alts B/C/E Project** | **Alts B/C/E Project + RFFA** | **Non-Project** | **Cum** | **Thld** | **Bkgd (µeq/l)** | **Alts B/C/E Project** | **Alts B/C/E Project + RFFA** | **Non-Project** | **Cum** | **Thld** |
| **Bridger WA** | I | Black Joe | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.01 | 0.03 | 0.03 | 3 | 69.0 | 0.3 | 0.4 | 2.2 | 2.6 | 10 |
| | | Deep | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.01 | 0.03 | 0.03 | 3 | 61.0 | 0.3 | 0.4 | 2.5 | 2.9 | 10 |
| | | Hobbs | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | <0.01 | 0.02 | 0.02 | 3 | 68.0 | 0.2 | 0.3 | 1.2 | 1.5 | 10 |
| | | Upper Frozen | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.01 | 0.03 | 0.03 | 3 | 5.8 | 0.2 [a] | 0.25 [a] | **1.6** [a] | **1.8** [a] | **1** [a] |
| **Fitzpatrick WA** | I | Ross | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.01 | 0.02 | 0.02 | 3 | 61.4 | 0.3 | 0.4 | 1.7 | 2.1 | 10 |
| **Absaroka-Beartooth WA** | II | Stepping Stone | <0.01 | <0.01 | 0.02 | 0.02 | 5 | 0.01 | 0.01 | 0.02 | 0.03 | 3 | 27.0 | 0.4 | 0.6 | 2.0 | 2.5 | 10 |
| | | Twin Island | <0.01 | <0.01 | 0.01 | 0.02 | 5 | 0.01 | 0.01 | 0.02 | 0.03 | 3 | 36.0 | 0.3 | 0.4 | 1.4 | 1.8 | 10 |
| **Cloud Peak WA** | II | Emerald | <0.01 | <0.01 | 0.03 | 0.03 | 5 | 0.02 | 0.03 | 0.07 | 0.10 | 3 | 53.3 | 1.1 | 1.4 | 4.4 | 5.9 | 10 |
| | | Florence | <0.01 | <0.01 | 0.03 | 0.03 | 5 | 0.02 | 0.03 | 0.08 | 0.11 | 3 | 32.7 | 1.7 | 2.3 | 8.1 | **10.4** [b] | **10** [b] |
| **Popo Agie WA** | II | Lower Saddlebag | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | 0.01 | 0.03 | 0.04 | 3 | 55.5 | 0.3 | 0.5 | 3.2 | 3.6 | 10 |

Source: Argonne (2002)

Notes: **Alts B/C/E** Project - Direct modeled Alternatives' B/C/E impacts.

**Alts B/C/E Project + RFFA** - Direct modeled Alternatives' B/C/E impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest

**Non-Project** - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alts B/C/E**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.

**Cum** - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alts B/C/E** Project and Non-Project impacts. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

**Thld** - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from FS (2000).

**WA** - Wilderness Area.

**a** - Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 μeq/l, the applicable significance threshold is less than a 1 μeq/l change. This threshold is exceeded by Non-Project and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

**b** – The potential cumulative impact of 10.4 μeq/l change would exceed the threshold level of 10 μeq/l for Florence Lake.

### TABLE AQ-9
### ALTERNATIVES B/C/E - DAILY FLAG REFINED METHOD - VISIBILITY IMPACT ANALYSIS (NUMBER OF DAYS Δ1.0 DV PER YEAR)

| Sensitive Location | PSD Classification | Alts B/C/E Project | Alts B/C/E Project + RFFA | Non-Project | Cum |
|---|---|---|---|---|---|
| Badlands WA | mandatory federal Class I | 0 | 0 | 17 to 25 | 21 to 28 |
| Bridger WA | mandatory federal Class I | 2 | 3 | 8 to 10 | 10 to 12 |
| Fitzpatrick WA | mandatory federal Class I | 2 | 3 | 7 to 9 | 10 to 12 |
| Gates of the Mountains WA | mandatory federal Class I | 0 | 0 | 3 to 4 | 4 to 4 |
| Grand Teton NP | mandatory federal Class I | 0 | 0 | 4 to 6 | 6 to 8 |
| North Absaroka WA | mandatory federal Class I | 2 | 4 | 10 to 12 | 13 to 15 |
| Red Rock Lakes WA | mandatory federal Class I | 0 | 0 | 0 to 1 | 2 to 3 |
| Scapegoat WA | mandatory federal Class I | 0 | 0 | 2 to 2 | 3 to 3 |
| Teton WA | mandatory federal Class I | 1 | 3 | 7 to 9 | 10 to 11 |
| Theodore Roosevelt NP (North Unit) | mandatory federal Class I | 0 | 0 | 1 to 2 | 2 to 3 |
| Theodore Roosevelt NP (South Unit) | mandatory federal Class I | 0 | 1 | 2 to 4 | 4 to 7 |
| U.L. Bend WA | mandatory federal Class I | 1 | 1 | 5 to 5 | 6 to 8 |
| Washakie WA | mandatory federal Class I | 3 | 5 | 11 to 14 | 16 to 18 |
| Wind Cave NP | mandatory federal Class I | 0 | 0 | 21 to 27 | 25 to 32 |
| Yellowstone NP | mandatory federal Class I | 1 | 3 | 9 to 11 | 12 to 13 |
| | | | | | |
| Fort Peck IR | Tribal designated Class I | 0 | 1 | 1 to 2 | 4 to 5 |
| Northern Cheyenne IR | Tribal designated Class I | 33 | 60 | 30 to 38 | 87 to 92 |
| | | | | | |
| Absaroka-Beartooth WA | federal Class II | 2 | 4 | 28 to 29 | 32 to 33 |
| Agate Fossil Beds NM | federal Class II | 0 | 0 | 10 to 15 | 14 to 19 |
| Bighorn Canyon NRA | federal Class II | 9 | 17 | 19 to 21 | 32 to 34 |
| Black Elk WA | federal Class II | 0 | 1 | 20 to 26 | 24 to 31 |
| Cloud Peak WA | federal Class II | 6 | 10 | 21 to 28 | 35 to 39 |
| Crow IR | federal Class II | 61 | 75 | 56 to 61 | 113 to 116 |

### TABLE AQ-9
### ALTERNATIVES B/C/E - DAILY FLAG REFINED METHOD - VISIBILITY IMPACT ANALYSIS (NUMBER OF DAYS Δ1.0 DV PER YEAR)

| Sensitive Location | PSD Classification | Alts B/C/E Project | Alts B/C/E Project + RFFA | Non-Project | Cum |
|---|---|---|---|---|---|
| Devils Tower NM | federal Class II | 1 | 3 | 24 to 38 | 34 to 47 |
| Fort Belknap IR | federal Class II | 1 | 1 | 60 to 61 | 61 to 62 |
| Fort Laramie NHS | federal Class II | 0 | 1 | 13 to 17 | 16 to 20 |
| Jewel Cave NM | federal Class II | 0 | 0 | 24 to 31 | 28 to 36 |
| Mount Rushmore NMem | federal Class II | 0 | 0 | 17 to 22 | 20 to 26 |
| Popo Agie WA | federal Class II | 2 | 3 | 8 to 10 | 11 to 13 |
| Soldier Creek WA | federal Class II | 0 | 0 | 13 to 18 | 16 to 21 |

Source: Argonne (2002)

Notes: **Alts B/C/E Project** - Direct modeled Alternatives' B/C/E impacts.

**Alts B/C/E Project + RFFA** - Direct modeled Alternatives' B/C/E impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.

**Non-Project** - Direct modelednon-project source impacts. The impact from all air pollutant emission sources not included in **Alts B/C/E**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS sources. The range of values corresponds to including Wyoming Alternative 3 (low) to Wyoming Alternative 1 (high).**Cum** - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alts B/C/E** Project and Non-Project impacts, which can occur at different locations. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

Locations:

**IR** - Indian Reservation.
**NHS** - National Historic Site.
**NM** - National Monument
**NMem** - National Memorial.
**NP** - National Park.
**NRA** - National Recreation Area
**WA** - Wilderness Area.

## TABLE AQ-10
## ALTERNATIVE D - PREDICTED CRITERIA POLLUTANT IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS (IN (µG/M$^3$)

| Pollutant | Avg Time [a] | Location | PSD Increment | Alt D Project | Alt D Project + RFFA | Non-Project | Cum | Back-ground | Total | NAAQS | MAAQS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **carbon monoxide** | 1-hour | near-field | - - - | 48 | 47.7 | 540 | 540.8 | 15,000 | 15,541 | 40,000 | 26,000 |
| | | far-field [1] | - - - | 2 | 2.2 | 100 | 100.0 | 15,000 | 15,100 | 40,000 | 26,000 |
| | 8-hours | near-field | - - - | 29 | 29.6 | 311.3 | 319.8 | 6,600 | 6,920 | 10,000 | 10,000 |
| | | far-field [1] | - - - | 1 | 1.8 | 52 | 51.8 | 6,600 | 6,652 | 10,000 | 10,000 |
| **nitrogen dioxide** | 1-hour | near-field | - - - | 50 | 59.6 | 181 | 195.1 | 117 | 312.1 | - - - | 566 |
| | | far-field [3] | - - - | 33 | 32.7 | 27.5 | 43.9 | 117 | 160.1 | - - - | 566 |
| | Annual | near-field | 25 | 6.4 | 6.5 | 4.8 | 7.8 | 11 | 18.814. | 100 | 100 |
| | | far-field [3] | 25 | 2.4 | 2.8 | 1.1 | 3.5 | 11 | 5 | 100 | 100 |
| | | far-field [2] | 2.5 | 1.1 | 2.0 | 0.5 | **2.5**[e] | 11 | 13.5 | 100 | 100 |
| **PM$_{2.5}$** | 24-hours | near-field | - - - | 4.3 | 4.7 | 44.1 | 45.3 | 20 | **65.3** [b] | **65** [b] | - - - |
| | | far-field [3] | - - - | 2.6 | 2.9 | 10.6 | 12.8 | 20 | 32.8 | 65 | - - - |
| | Annual | near-field | - - - | 1.2 | 1.2 | 5.6 | 6.0 | 8 | 14.0 | 15 | - - - |
| | | far-field [4] | - - - | <0.1 | <0.1 | 1.2 | 1.2 | 8 | 9.2 | 15 | - - - |
| **PM$_{10}$** | 24-hours | near-field | **30** [c] | 10.8 | 11.5 | **103.8** [c] | **106.5** [c] | 105 | **211.5** [d] | **150** [d] | **150** [d] |
| | | far-field [4] | 30 | 0.1 | 0.2 | 29.7 | 29.7 | 105 | 134.7 | 150 | 150 |
| | | far-field [2] | **8** [c] | 3.3 | 4.4 | **8.4** [c] | **11.1** [c] | 105 | 116.1 | 150 | 150 |
| | | far-field [5] | **8** [c] | 0.6 | 0.9 | 7.2 | **8.1** [c] | 105 | 113.1 | 150 | 150 |
| | Annual | near-field | 17 | 3.3 | 3.4 | 13.1 | 14.1 | 30 | 44.1 | 50 | 50 |
| | | far-field [4] | 17 | <0.1 | <0.1 | 2.7 | 2.7 | 30 | 32.7 | 50 | 50 |
| **sulfur dioxide** | 1-hour | near-field | - - - | 4.5 | 4.5 | 27.4 | 28.2 | 666 | 694.2 | - - - | 1,300 |
| | | far-field [3] | - - - | 2.2 | 2.2 | 29.6 | 29.6 | 666 | 695.6 | - - - | 1,300 |
| | 3-hours | near-field | 512 | 3.5 | 3.5 | 22.6 | 23.6 | 291 | 314.6 | 1,300 | - - - |
| | | far-field [3] | 512 | 1.7 | 1.8 | 17.1 | 17.1 | 291 | 308.1 | 1,300 | - - - |
| | 24-hours | near-field | 91 | 2.1 | 2.1 | 9.8 | 10.5 | 73 | 83.5 | 365 | 260 |
| | | far-field [3] | 91 | 1.0 | 1.1 | 5.3 | 5.3 | 73 | 78.3 | 365 | 260 |
| | Annual | near-field | 20 | 0.7 | 0.7 | 1.0 | 1.2 | 16 | 17.1 | 80 | 60 |
| | | far-field [3] | 20 | 0.3 | 0.3 | 0.4 | 0.4 | 16 | 16.4 | 80 | 60 |

Source: Argonne (2002)

Notes: [a] Annual impacts are the first maximum value; short-term impacts are the second maximum value. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

[b] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 20 $\mu g/m^2$ were predicted to exceed the National ambient air quality standards due to **Cum** emission sources.

[c] It is possible that Non-Project and/or **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation and Washakie Wilderness Area, as well as the PSD Class II increment near the maximum assumed development; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate air quality regulatory agency.

[d] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 105 $\mu g/m^2$ were predicted to exceed the National and Montana ambient air quality standards due to **Cum** emission sources.

[e] Actual model results equal to 2.45 $\mu g/m^3$. See Argonne (2002) Appendix C, Table C.1.2.3.

**Alt D** Project - Direct modeled Alternative D impacts.

**Alts D Project + RFFA** - Direct modeled Alternatives' D impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.

**Non-Project** - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt D**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.

**Cum** – Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt D** Project and Non-Project impacts, which can occur at different locations.

**Total** - The sum of the cumulative modeled impact and the assumed background concentration.

**NAAAQS** - Applicable National Ambient Air Quality Standard.

**MAAQS** - Applicable Montana Ambient Air Quality Standard.

Locations:

**1** – Absaroka-Beartooth Wilderness Area

**2** – Northern Cheyenne Indian Reservation

**3** – Crow Indian Reservation

**4** – Fort Belknap Indian Reservation

**5** – Washakie Wilderness Area

## TABLE AQ-11
## ALTERNATIVE D - PREDICTED ATMOSPHERIC DEPOSITION IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS

| | | | **Total Sulfur Deposition (kg/ha-yr)** | | | | | **Total Nitrogen Deposition (kg/ha-yr)** | | | | | **Acid Neutralizing Capacity (per cent)** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **PSD Class** | **Lake** | **Alt D Project** | **Alt D Project + RFFA** | **Non-Project** | **Cum** | **Thld** | **Alt D Project** | **Alt D Project + RFFA** | **Non-Project** | **Cum** | **Thld** | **Bkgd (µeq/l)** | **Alt D Project** | **Alt D Project + RFFA** | **Non-Project** | **Cum** | **Thld** |
| **Bridger WA** | I | Black Joe | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | <0.01 | 0.03 | 0.03 | 3 | 69.0 | 0.2 | 0.2 | 2.2 | 2.4 | 10 |
| | | Deep | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | <0.01 | 0.03 | 0.03 | 3 | 61.0 | 0.2 | 0.2 | 2.5 | 2.7 | 10 |
| | | Hobbs | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | <0.01 | 0.02 | 0.02 | 3 | 68.0 | 0.1 | 0.2 | 1.2 | 1.4 | 10 |
| | | Upper Frozen | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | <0.01 | 0.03 | 0.03 | 3 | 5.8 | 0.1 [a] | 0.13 [a] | **1.6** [a] | **1.7** [a] | **1** [a] |
| **Fitzpatrick WA** | I | Ross | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | <0.01 | 0.02 | 0.02 | 3 | 61.4 | 0.2 | 0.2 | 1.7 | 1.9 | 10 |
| **Absaroka-Beartooth WA** | II | Stepping Stone | <0.01 | <0.01 | 0.02 | 0.02 | 5 | <0.01 | 0.01 | 0.02 | 0.03 | 3 | 27.0 | 0.3 | 0.3 | 2.0 | 2.3 | 10 |
| | | Twin Island | <0.01 | <0.01 | 0.01 | 0.02 | 5 | <0.01 | 0.01 | 0.02 | 0.03 | 3 | 36.0 | 0.2 | 0.2 | 1.4 | 1.6 | 10 |
| **Cloud Peak WA** | II | Emerald | <0.01 | <0.01 | 0.03 | 0.03 | 5 | 0.01 | 0.02 | 0.07 | 0.09 | 3 | 53.3 | 0.6 | 0.7 | 4.4 | 5.2 | 10 |
| | | Florence | <0.01 | <0.01 | 0.03 | 0.03 | 5 | 0.01 | 0.02 | 0.08 | 0.09 | 3 | 32.7 | 0.9 | 1.1 | 8.1 | 9.2 | 10 |
| **Popo Agie WA** | II | Lower Saddlebag | <0.01 | <0.01 | 0.01 | 0.01 | 5 | <0.01 | <0.01 | 0.03 | 0.03 | 3 | 55.5 | 0.2 | 0.2 | 3.2 | 3.4 | 10 |

Source: Argonne (2002)

Notes: **Alt D** Project - Direct modeled Alternative D impacts.

**Alts D Project + RFFA** - Direct modeled Alternatives' D impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.

**Non-Project** - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt D**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.

**Cum** - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt D** Project and Non-Project impacts. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

**Thld** - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from FS (2000).

**WA** - Wilderness Area.

**a** - Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/l, the applicable significance threshold is less than a 1 µeq/l change. This threshold is exceeded by Non-Project and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

### TABLE AQ-12
### ALTERNATIVE D - DAILY FLAG REFINED METHOD - VISIBILITY IMPACT ANALYSIS (NUMBER OF DAYS >1.0 DV PER YEAR)

| Sensitive Location | PSD Classification | Alt D Project | Alt D Project + RFFA | Non-Project | Cum |
|---|---|---|---|---|---|
| Badlands WA | mandatory federal Class I | 0 | 0 | 17 to 25 | 20 to 26 |
| Bridger WA | mandatory federal Class I | 0 | 1 | 8 to 10 | 9 to 11 |
| Fitzpatrick WA | mandatory federal Class I | 0 | 0 | 7 to 9 | 8 to 10 |
| Gates of the Mountains WA | mandatory federal Class I | 0 | 0 | 3 to 4 | 3 to 4 |
| Grand Teton NP | mandatory federal Class I | 0 | 0 | 4 to 6 | 5 to 7 |
| North Absaroka WA | mandatory federal Class I | 0 | 1 | 10 to 12 | 12 to 14 |
| Red Rock Lakes WA | mandatory federal Class I | 0 | 0 | 0 to 1 | 1 to 2 |
| Scapegoat WA | mandatory federal Class I | 0 | 0 | 2 to 2 | 2 to 3 |
| Teton WA | mandatory federal Class I | 0 | 0 | 7 to 9 | 9 to 10 |
| Theodore Roosevelt NP (North Unit) | mandatory federal Class I | 0 | 0 | 1 to 2 | 1 to 2 |
| Theodore Roosevelt NP (South Unit) | mandatory federal Class I | 0 | 0 | 2 to 4 | 3 to 5 |
| U.L. Bend WA | mandatory federal Class I | 0 | 0 | 5 to 5 | 5 to 6 |
| Washakie WA | mandatory federal Class I | 1 | 1 | 11 to 14 | 14 to 16 |
| Wind Cave NP | mandatory federal Class I | 0 | 0 | 21 to 27 | 23 to 29 |
| Yellowstone NP | mandatory federal Class I | 0 | 0 | 9 to 11 | 11 to 12 |
| | | | | | |
| Fort Peck IR | Tribal designated Class I | 0 | 0 | 1 to 2 | 2 to 3 |
| Northern Cheyenne IR | Tribal designated Class I | 17 | 38 | 30 to 38 | 70 to 76 |
| | | | | | |
| Absaroka-Beartooth WA | federal Class II | 0 | 1 | 28 to 29 | 30 to 31 |
| Agate Fossil Beds NM | federal Class II | 0 | 0 | 10 to 15 | 12 to 17 |
| Bighorn Canyon NRA | federal Class II | 3 | 7 | 19 to 21 | 2 to 28 |
| Black Elk WA | federal Class II | 0 | 0 | 20 to 26 | 22 to 28 |
| Cloud Peak WA | federal Class II | 1 | 2 | 21 to 28 | 28 to 35 |
| Crow IR | federal Class II | 42 | 56 | 56 to 61 | 102 to 105 |
| Devils Tower NM | federal Class II | 0 | 0 | 24 to 38 | 29 to 42 |

## TABLE AQ-12
## ALTERNATIVE D - DAILY FLAG REFINED METHOD - VISIBILITY IMPACT ANALYSIS (NUMBER OF DAYS >1.0 DV PER YEAR)

| Sensitive Location | PSD Classification | Alt D Project | Alt D Project + RFFA | Non-Project | Cum |
|---|---|---|---|---|---|
| Fort Belknap IR | federal Class II | 0 | 0 | 60 to 61 | 61 to 61 |
| Fort Laramie NHS | federal Class II | 0 | 0 | 13 to 17 | 15 to 18 |
| Jewel Cave NM | federal Class II | 0 | 0 | 24 to 31 | 26 to 34 |
| Mount Rushmore NMem | federal Class II | 0 | 0 | 17 to 22 | 18 to 23 |
| Popo Agie WA | federal Class II | 0 | 1 | 8 to 10 | 9 to 11 |
| Soldier Creek WA | federal Class II | 0 | 0 | 13 to 18 | 14 to 20 |

Source: Argonne (2002)

Notes: **Alt D** Project - Direct modeled Alternative D impacts.

**Alts D Project + RFFA** - Direct modeled Alternatives' D impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.

**Non-Project** - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt D**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS sources. The range of values corresponds to including Wyoming Alternative 3 (low) to Wyoming Alternative 1 (high).

**Cum** - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt D** Project and Non-Project impacts, which can occur at different locations. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

Locations:

**IR** - Indian Reservation.
**NHS** - National Historic Site.
**NM** - National Monument
**NMem** - National Memorial.
**NP** - National Park.
**NRA** - National Recreation Area
**WA** - Wilderness Area.

# 9.0 Thresholds For Triggering Mitigation

## 9.1 Clean Air Act Regulatory Thresholds

For Prevention of Significant Deterioration (PSD) of air quality, modeled and monitored results for $PM_{10}$and $NO_2$ will be evaluated against the Class I and Class II increments to determine if additional mitigation will be required (see Table AQ-1).

Monitoring data only will be used to determine if the NAAQS $PM_{10}$ and $NO_2$ standards (see Table AQ-1) have been exceeded. For federal lands with Class I areas, the Clean Air Act sets a 60-year goal of clear vistas. Clear vistas are defined as reduction in visibility not to exceed 1.0 deciview/year for more than 1 day. Where this threshold is exceeded from a single project, this could be the basis for the federal land managers' designation of visibility impairment. Such a designation could necessitate mitigation. Where the threshold is exceeded based on cumulative actions (i.e. RFFA), this also could be the basis for the federal land managers' designation of visibility impairment. In this instance, Congress directed federal land managers to implement mitigation pursuant to the Regional Haze Rule, in a manner that results in a 25% reduction in impairment every 15-year period to meet the 60-year clear vistas goal.

In order to prevent violations of national and local air quality standards, emission controls need to be implemented before standards are violated. For an analytic approach, implementation of control adequate to lead to no predicted cumulative violations are adequate, since all known and anticipated emissions will presumably be modeled within model uncertainties. $NO_2$ modeling of this well understood gas should be accurate enough to base mitigation decisions.

## 9.2 "Levels of Concern"

If mitigation measures are not fully implemented until regulatory thresholds are exceeded, then a regulatory process is triggered to resolve the exceedances. Such a process may be lengthy, costly and administratively burdensome. Agencies may wish to avoid such a process by establishing a "level of concern" short of regulatory thresholds, which would trigger implementation of control measures of a type and quantity sufficient to avoid reaching regulatory thresholds.

Where predictive capability is well-developed, as is the case with modeling of $NO_2$, an LOC might more closely approach the regulatory threshold. However, with a pollutant such as $PM_{10}$, greater uncertainties exist in the prediction of ambient concentrations due to such factors as differential particle settling. In such a case, an LOC may need to be established at a lower level to achieve the objective of avoiding regulatory exceedances.

## 9.3 Mitigation Measures

If air quality mitigation applied by all parties in the Powder River Basin are proven to be inadequate, cumulatively, to maintain these Class I and Class II increment limits based on regulatory air quality modeling or monitored conditions, Montana, Wyoming, or the Tribes may impose either a State or Tribal Implementation Plan (SIP or TIP) to assure preservation of the rural air quality. EPA may itself impose a Federal Implementation Plan (FIP) to obtain controls on all regulated pollutant emission sources in order to assure preservation of the rural air quality.

## 9.4 Mitigation

Tables AQ-13 and AQ-14 include the array of measures available to mitigate potential $PM_{10}$ and $NO_x$ impacts and the effectiveness of each measure.

## TABLE AQ-13
## FUGITIVE DUST MITIGATION MEASURES (PM10), EFFECTIVENESS AND COST

| | **Dust Sources** | | | | | |
|---|---|---|---|---|---|---|
| | **Disturbed Areas** | **Unpaved Roads[1]** | | | | |
| Mitigation Options | Establish plant cover for all disturbed lands by certain time (re-vegetation) | Water roads to attain certain percent moisture | Apply soil stabilizer | Set and enforce speed limit | Gravel roads | Pave road |
| Effectiveness | Level proportional to percentage of land cover | 0 – 50% reduction in uncontrolled dust emissions | 33 to 100% control efficiency | 80% for 15 mph<br>65% for 20 mph<br>25% for 30 mph [2] | 30% reduction | 90% reduction |
| Estimated Cost | $/acre | $4000/mile | $2,000 to $4,000/mile per year | Unknown | $9,000/mile | $11,000 to $60,000/mile |

[1] Improved and County roads

[2] Reductions assume 40 mile per hour base speed.

## TABLE AQ-14
## NITROGEN OXIDES (NOX) MITIGATION MEASURES EFFICIENCY

| | **No$_x$ Emissions Sources[1]** | | | |
|---|---|---|---|---|
| | **Field Compressors** | **Sales Compressors** | **Temporary Diesel Generators [2]** | **Heavy Equipment** |
| Mitigation Options/Efficiency | Implement Best Available Control Technology<br>Typically results in a NO$_x$ emission rate of about 1 g/bhp-hr | Implement Best Available Control Technology<br>Typically results in a NO$_x$ emission rate of about 1 g/bhp-hr | Register with State; will regulate as appropriate | Voluntary use of diesel engines |

1 Using electric – powered compressor motors in place of the typical natural-gas fired compressor engines could eliminate direct NO$_x$ emissions from compressor station locations.

[2] Wyoming is currently registering these generators to determine if No$_x$ emissions are significant.

# HYDROLOGY APPENDIX

# Summary of Water Resources Technical Report

## Introduction

During the second half of the 1990s, coal bed methane (CBM) production increased dramatically nationwide to represent a significant new source of natural gas to meet ever-growing energy demands. In Montana, oil & gas development has been growing since the first oil wells were drilled in the early 20th century. There are currently more than 200 commercially producing CBM wells in the state of Montana, all of which are located in the Powder River Basin near the town of Decker, Montana. CBM development in the Montana portion of the Powder River Basin (PRB) is in part a result of successful development in the Wyoming portion of the basin where CBM activity started as early as 1993 (Flores et al. 2001).

A primary intent of the Montana CBM Environmental Impact Statement (EIS) is to provide an overall projection of impacts associated with CBM development for the planning areas and to address issues raised as part of the public scoping process. Of primary consideration for the EIS are water resources. Due to the extraction methods required for CBM production, impacts to surface water and groundwater can potentially result from CBM development. The purpose of the Water Resources Technical Report (WRTR) (ALL 2001b) is to serve as one of many supporting documents for the subject EIS. Following is a short summary of the WRTR.

## Public Scoping Issues

During the scoping process for the Montana CBM EIS, the public was provided with the opportunity to review and comment on resource issues identified as important by the Bureau of Land Management (BLM) and the State of Montana. The public was also provided an opportunity to identify new issues and comment on the Draft Planning Criteria. Water issues raised through the public scoping process include groundwater quality and quantity, surface water quality and availability, produced water management, water conservation, water rights, and groundwater resource assessment.

## Study Area

The planning area for the EIS is defined as the area where oil and gas decisions will be made by the BLM and the State of Montana. The BLM's planning area is the oil and gas estate administered by the BLM in the Powder River and Billings Resource Management Planning (RMP) areas. The State of Montana's planning area is statewide, with emphasis on the state-administered oil and gas within the BLM planning area and in Blaine, Park and Gallatin counties. The planning area excludes those lands administered by other agencies (for example, Forest Service and Tribal Councils). For ease of reference, the Billings and Powder River RMP areas, and Blaine, Park, and Gallatin counties, are referred to in the document as the BLM and State "CBM emphasis area." This is the 16-county area within the BLM and state planning area where CBM development interest has been identified.

## CBM Production Operations

During CBM production, water is pumped up a tubing string to be put into a water flow-line for handling or discharge. At the only producing CBM field in the Montana portion of the PRB, the water is either used in drilling new wells, pumped into ponds for use by the land owner, or discharged to the Tongue River through a MDEQ discharge permit. Assessment of management alternatives requires an accurate estimate of the amount of produced water to be produced from each well. CBM wells must pump water from the reservoir to lower pressure within the coal, to augment the formation of cleat, and to allow the natural gas to break out as a discrete phase. The amount of water that must be pumped off appears to vary not only from reservoir to reservoir, but also during the history of each individual producing well according to the specific coal bed reservoir it is producing from, and its proximity to other producing wells. The WRTR compiles average water production rates for approximately 200 wells in the CX field normalized to the age of each well (MBOGC oil and gas database). This data was prepared by averaging the water production rates from active CBM wells during each month dating from the date of first production. The exponential trend line is extrapolated from this data is: $Q = 14.661e^{-0.0242t}$ When Q is discharge per well in gallons per minute (gpm), and t is time in months. This indicates that initial discharges are approximately 15 gpm per well, and the 20-year average discharge would be 2.5 gpm. It should be noted that although the average initial discharge is approximately 15 gpm, some wells have discharges as high as 20-25 gpm.

## Regional Geology

The planning area of the EIS centers on the Powder River RMP area and the Billings RMP area. The planning area contains three major basinal features – Powder River, Big Horn, and Bull Mountains – and surrounding uplifted areas. The asymmetric basins are the result of sedimentary deposition and structural subsidence with most of the fill consisting of the Fort Union Formation. The Fort Union Formation also contains most of the coals occurring in these three basins.

### Fort Union Formation

The Fort Union Formation encloses the various coal seams within the Montana portion of the PRB; these coals function as the source and reservoir for the CBM, as well as aquifers carrying groundwater of varying quantity and quality. Depth to coal seams in the Montana portion of the PRB range from exposure at ground surface to 1,000 feet or more below land surface. Coal thickness varies from thin stringers to over 50 feet and can form aggregate thicknesses that exceed 100 feet. Coal seams in the Fort Union do not have significant matrix porosity and permeability; they can act as aquifers because fluids such as water and methane are contained within the coal's fracture system, known as cleat. The fractures accumulate the fluids and allow the fluids to move horizontally and vertically.

### Quaternary Alluvium

Quaternary age sediments are those that are Pleistocene (the latest glacial episode) and Recent (post-glacial episode) in age; the sequence is dominated by events and effects associated with continental glaciation, including glacial till and exaggerated peri-glacial valley fill. Quaternary sediments in the PRB and most of the state are present as variable fill in stream and river valleys. Quaternary Alluvium consists of unconsolidated sand, silt, and gravel that make up the floodplains and stream terraces of creek valleys in the PRB. Alluvium aquifers are largely unconfined and connected to active river flow. Because alluvial aquifers can deliver large quantities of water-to-water supply wells, they are important stratigraphic features. Alluvial aquifers can be impacted by surface activity and can act as a conduit to carry those impacts to valuable surface water resources.

## Hydrology

Hydrology identifies aquifers (porous units containing water) and aquitards (non-porous strata that serve to confine and separate aquifers) in a geographic and vertical sense. Aquifers can contain drinkable water, brackish water of limited usability, or salt water. In the EIS planning area, several formations contain drinking water but show variable reservoir quality and water quality. The Montana portion of the PRB includes many aquifers that represent different hydrologic flow regimes. The basin includes unconfined aquifers as well as confined, bedrock aquifers. Aquifers range from the unconfined Quaternary alluvium in the streambeds of rivers and creeks to the Mississippian Age Madison Formation in excess of 10,000 feet below the surface. The water quality within these aquifers ranges from less than 300 mg/L TDS to more than 30,000 mg/L TDS. The aquifers also vary in depth from the basin center to the margin. Coal aquifers are widespread, supply large numbers of water wells, and will be impacted most by CBM production. Alluvial aquifers are commonly unconfined and in direct contact with surface water and can, therefore, be impacted by surface discharge of CBM water.

### Watersheds

Watersheds are important to predicting the impacts from CBM development in Montana. Water resource factors such as water quality, water use, and potential impacts are discussed throughout the report in terms of watersheds. Each watershed is drained by a single stream or river and each is bounded by a no-flow topographic boundary. Streams and rivers are profoundly influenced by their watersheds; in particular water volume and water quality vary from base flow conditions to high-flow conditions under the control of runoff from land surfaces and recharge to rivers by aquifers. The WRTR highlights the watersheds in the PRB along with potential CBM areas.

### Groundwater Quality

Quality of groundwater resources are detailed in the WRTR. The report lists quality statistics for the major aquifers from various parts of the CBM emphasis area with emphasis on the coal seam aquifers.

## Water Resources Impact Issues

### Groundwater Drawdown from CBM Development

Groundwater drawdown from CBM production has been documented inside and adjacent to existing production in Montana. CBM production in the PRB requires drawdown of coal aquifers within the producing field in order to liberate methane. Water wells and springs to but outside of a producing CBM field may also be impacted. Drawdown can be documented by way of dedicated monitoring wells or by gauging private water wells. In Montana's CX Ranch CBM field, the MBMG has installed monitoring wells designed to track drawdown due to the coal mines in the area as well as CBM development.

## Surface Water Impact from Discharge

Impacts to surface water from discharge of CBM water can be severe depending upon the quality of the CBM water. Some watersheds may be able to absorb the discharged water while others are sensitive to large amounts of low-quality CBM water. Surface water quality in the watersheds is tabulated in the WRTR. Water quality data is from stream gauging points maintained by the USGS; these multi-year collections of water quality data illustrate changes within the stream from times of high run-off (typically June for the PRB) when the river is the highest and water is mostly the result of precipitation from spring rains and melting snow. During periods of high flow the streams and rivers contain higher quality water. The USGS data also contains data on base-flow conditions (typically winter in the PRB) when streams are at their lowest flow and water quality is the lowest since much of the water is recharge from alluvial and bedrock aquifers where groundwater is often of low quality. Discharge scenarios are described and resultant water quality is computed on a watershed basis.

## Mitigation

CBM production in the Montana PRB will certainly impact groundwater. Impacts to groundwater resources may however be mitigated through the use of water well agreements, limits placed on discharge and monitoring programs. Furthermore, a predictive model may be helpful as an approximation of future impacts. Groundwater rights will be protected through the use of spring/water well mitigation agreements and an approved monitoring plan to aid in the identification of potentially significant drawdown impacts. Surface water resources can be protected by limiting discharge through alternative management techniques.

## Conclusions and Attachments

The WRTR concludes with a list of key water resource factors that are important to the subject of impacts. The appendices contain several pertinent documents as well as groundwater drawdown data from monitoring wells in the vicinity of the CX Ranch field, decline analysis from the CX Ranch field, and groundwater quality data from coal seam aquifers.

# TMDL Schedule for CBM Emphasis Area of Montana

Section 303 (d) of the Federal Clean Water Act and Sections 75-5-701 MCA, et.seq. of the Montana Water Quality Act require Montana to develop "Total Maximum Daily Loads" (TMDLs) for lakes, rivers, and streams that are not meeting water quality standards. A TMDL is the amount of a pollutant that a waterbody can assimilate from point, non-point and natural sources and still meet water quality standards. In short, TMDLs guide the development of discharge targets for contributing sources that once implemented will restore or protect water quality.

All waters in Montana have been assigned to one of nine classifications based upon their presumed ability to support certain beneficial uses (i.e. drinking water, recreation, fisheries and aquatic life, agriculture, and industrial uses). Each classification has specific water quality standards including numerical and narrative limits. Waters that fail to meet the numerical or narrative standards are considered impaired. Montana must develop one or more TMDLs for each impaired waterbody.

In accordance with Section 303(d) of the Federal Clean Water Act, the Montana Department of Environmental Quality (MDEQ) has prepared a list of impaired and threatened waters every two years since 1992. This so called "303(d) list" identifies lakes, rivers and streams that are not meeting water quality standards and establishes priorities for TMDL development. However, Montana like the rest of the nation was slow to develop TMDLs.

On June 21, 2000, the United States District Court of Montana ordered EPA to work with the State of Montana to develop and adopt a schedule that would result in developing all necessary TMDLs for waters on Montana's 1996 Section 303(d) list (EIS Table 3-6) by May 5, 2007. On November 1, 2000, MDEQ and EPA published a schedule that was based upon a watershed or planning area approach. MDEQ divided the state into 91 TMDL Planning Areas each with a deadline for completing all necessary TMDLs. The surface waters likely to be affected by coal bed methane (CBM) development are located in the Tongue and Powder TMDL Planning Areas. The TMDL completion dates for these planning areas are 2005 and 2006, respectively.

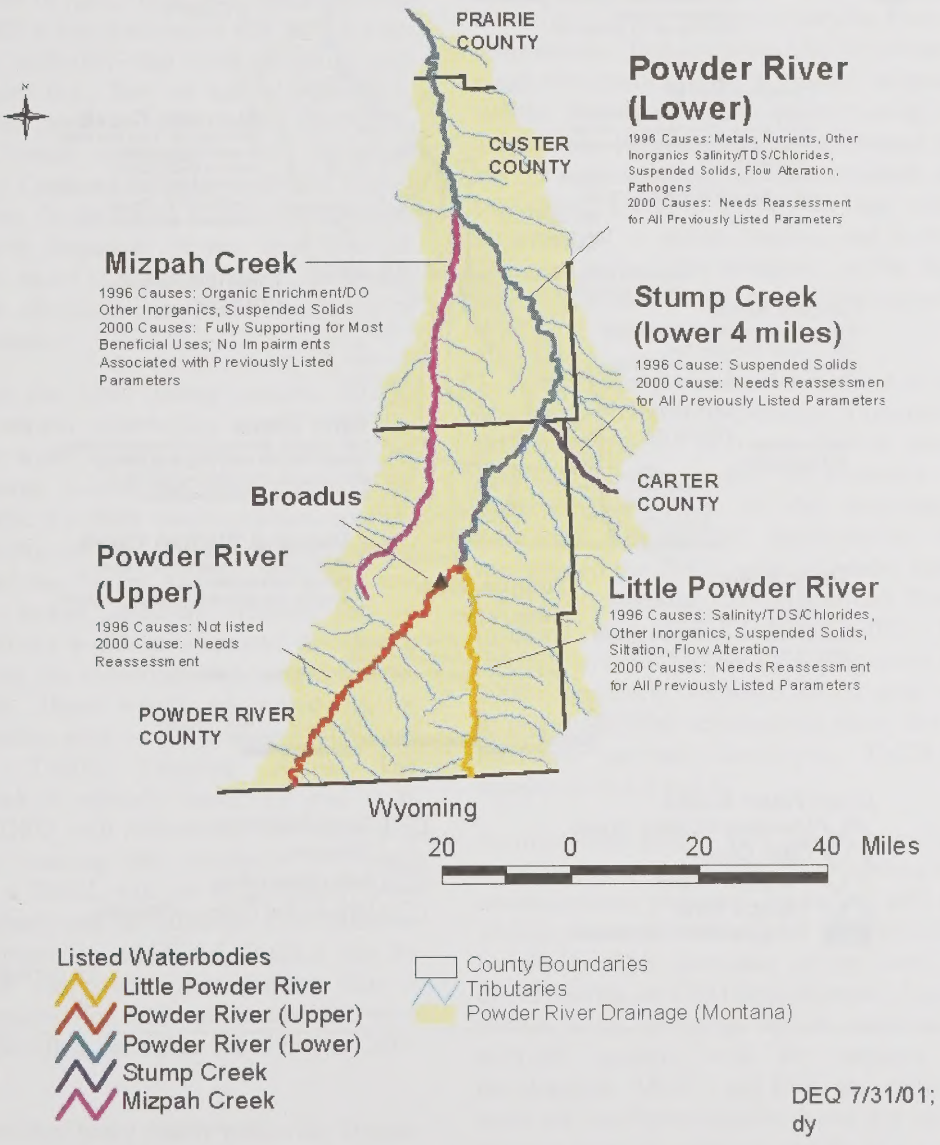
Independent of the court order, but as required by the Federal Clean Water Act and the Montana Water Quality Act, MDEQ prepared a 303(d) list in 2000. The 2000 list was approved by EPA on January 29, 2001 and is superior to earlier lists for several reasons. First, significantly more data was available for making listing decisions. Second, the public review process was substantially expanded including a lengthy comment period and 17 public meetings around the state. Third, MDEQ significantly improved the methods for making listing decisions. Fourth, MDEQ dramatically improved the supporting documentation for all listing decisions and made the information easily accessible by the public.

Although the court order mandates the 1996 list (EIS Table 3-6) as the starting point, both the 1996 and the 2000 lists should be consulted when making TMDL decisions. Figures HYD-1 and HYD-2 provide a summary of the waters in the Tongue and Powder river basins that are on the 1996 and 2000 lists. The figures identify the pollutants of concern, summarize the reasons for the listings, and explain the differences between the two lists.

FIGURE HYD-1

## Powder River Drainage Area in Montana - Impaired Waterbodies Status (7/31/2001 Draft Reference Map)

An impaired water body is a 303(d) listed water body that is not fully supporting beneficial uses due to one or more causes (parameters). Water Quality restoration planning and TMDL development is pursued for each parameter where assessment work verifies that a beneficial use support problem exists. The 1996 and 2000 303(d) lists, as well as parameters associated with Coal Bed Methane, currently define the priority parameters, many of which still need additional assessment work to verify whether or not there is a problem.


N
PRAIRIE COUNTY
CUSTER COUNTY
Powder River (Lower)
Mizpah Creek
Stump Creek (lower 4 miles)
CARTER COUNTY
Broadus
Powder River (Upper)
Little Powder River
POWDER RIVER COUNTY
Wyoming
20
0
20
40
Miles
Listed Waterbodies
Little Powder River
Powder River (Upper)
Powder River (Lower)
Stump Creek
Mizpah Creek
County Boundaries
Tributaries
Powder River Drainage (Montana)

**Powder River (Lower)**
1996 Causes: Metals, Nutrients, Other Inorganics Salinity/TDS/Chlorides, Suspended Solids, Flow Alteration, Pathogens
2000 Causes: Needs Reassessment for All Previously Listed Parameters

**Mizpah Creek**
1996 Causes: Organic Enrichment/DO Other Inorganics, Suspended Solids
2000 Causes: Fully Supporting for Most Beneficial Uses; No Impairments Associated with Previously Listed Parameters

**Stump Creek (lower 4 miles)**
1996 Cause: Suspended Solids
2000 Cause: Needs Reassessmen for All Previously Listed Parameters

**Powder River (Upper)**
1996 Causes: Not listed
2000 Cause: Needs Reassessment

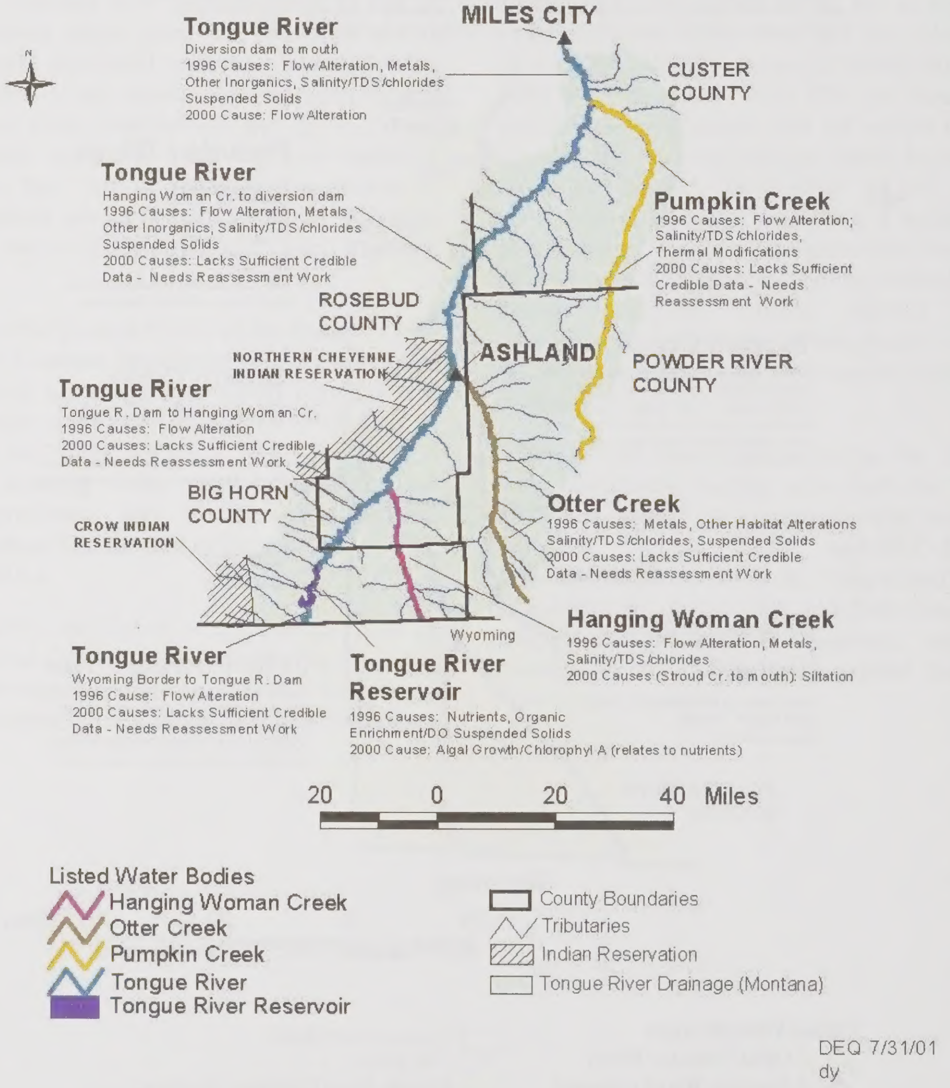
**Little Powder River**
1996 Causes: Salinity/TDS/Chlorides, Other Inorganics, Suspended Solids, Siltation, Flow Alteration
2000 Causes: Needs Reassessment for All Previously Listed Parameters

DEQ 7/31/01;
dy

FIGURE HYD-2

## Tongue River Drainage Area in Montana - Impaired Water Bodies Status (7/31/2001 Draft Reference Map)

An impaired water body is a 303(d) listed water body that is not fully supporting beneficial uses due to one or more causes (parameters). Water Quality restoration planning and TMDL development is pursued for each parameter where assessment work verifies that a beneficial use support problem exists. The 1996 and 2000 303(d) lists, as well as parameters associated with Coal Bed Methane, currently define the priority parameters, many of which still need additional assessment work to verify whether or not there is a problem.


MILES CITY
N
Tongue River
Diversion dam to mouth
1996 Causes: Flow Alteration, Metals, Other Inorganics, Salinity/TDS/chlorides Suspended Solids
2000 Cause: Flow Alteration
CUSTER COUNTY
Tongue River
Hanging Woman Cr. to diversion dam
1996 Causes: Flow Alteration, Metals, Other Inorganics, Salinity/TDS/chlorides Suspended Solids
2000 Causes: Lacks Sufficient Credible Data - Needs Reassessment Work
Pumpkin Creek
1996 Causes: Flow Alteration; Salinity/TDS/chlorides, Thermal Modifications
2000 Causes: Lacks Sufficient Credible Data - Needs Reassessment Work
ROSEBUD COUNTY
NORTHERN CHEYENNE INDIAN RESERVATION
ASHLAND
POWDER RIVER COUNTY
Tongue River
Tongue R. Dam to Hanging Woman Cr.
1996 Causes: Flow Alteration
2000 Causes: Lacks Sufficient Credible Data - Needs Reassessment Work
BIG HORN COUNTY
CROW INDIAN RESERVATION
Otter Creek
1996 Causes: Metals, Other Habitat Alterations Salinity/TDS/chlorides, Suspended Solids
2000 Causes: Lacks Sufficient Credible Data - Needs Reassessment Work
Hanging Woman Creek
1996 Causes: Flow Alteration, Metals, Salinity/TDS/chlorides
2000 Causes (Stroud Cr. to mouth): Siltation
Wyoming
Tongue River
Wyoming Border to Tongue R. Dam
1996 Cause: Flow Alteration
2000 Causes: Lacks Sufficient Credible Data - Needs Reassessment Work
Tongue River Reservoir
1996 Causes: Nutrients, Organic Enrichment/DO Suspended Solids
2000 Cause: Algal Growth/Chlorophyl A (relates to nutrients)
20 0 20 40 Miles
Listed Water Bodies
Hanging Woman Creek
Otter Creek
Pumpkin Creek
Tongue River
Tongue River Reservoir
County Boundaries
Tributaries
Indian Reservation
Tongue River Drainage (Montana)
DEQ 7/31/01
dy

The 2000 list provides substantially more and better information concerning the impairments and the sources that may be contributing to the problem. However, MDEQ or EPA is required to develop *all necessary* TMDLs for each waterbody and pollutant identified as impaired or threatened on the 1996 list. A TMDL may not be necessary for a waterbody listed on the 1996 list for a couple of reasons. First, a TMDL is unnecessary if further assessment, such as was done for the 2000 list, determines that the waterbody is meeting water quality standards for the particular pollutant. During the development of the 2000 list, MDEQ determined that several waters in the Tongue, Powder, and Little Powder river basins that were listed as impaired on the 1996 list, were actually meeting water quality standards for some of the listed pollutants (i.e., Mizpah Creek was found to be fully supporting for nutrients, dissolved oxygen, inorganics and suspended solids). Second, EPA has determined that TMDLs are not necessary for "pollution" that is not associated with a specific pollutant (i.e., flow or habitat alteration). EPA described their position on this issue to MDEQ in a July 23, 2001 letter concerning a flow alteration TMDL for Big Creek, a tributary of the Upper Yellowstone River. It should be noted however, that further assessment frequently shows that flow or habitat alterations cause high levels of pollutants (i.e., flow and habitat alteration can cause violations of temperature standards).

Although, during the 2000 listing process MDEQ determined that several waterbodies on the 1996 list were meeting the water quality standards for some of the listed pollutants, it was far more common for MDEQ to determine that there was insufficient credible data to make a listing decision. MDEQ determined that many segments of the Tongue and Powder rivers and some tributaries lacked sufficient credible data to determine whether the waters are impaired, threatened, or fully supporting the numerical and narrative water quality standards. These waters are scheduled for additional assessment prior to developing TMDLs for the associated TMDL Planning Areas. The reassessment work is already underway and it is possible that MDEQ will determine that additional waterbodies are meeting the standards for listed pollutants. If so, a TMDL will not be necessary, even though the waterbody and the pollutant were listed on the 1996 list. Conversely, additional TMDLs may be necessary if the assessment demonstrates that a waterbody is impaired for other pollutants that were not originally identified on either the 1996 or 2000 lists.

The 1996 list identified many waters within the Tongue and Powder TMDL planning areas as impaired by salinity, total dissolved solids, chlorides, metals, inorganics, suspended solids, siltation, nutrients, low dissolved oxygen, pathogens, flow alteration, thermal modification, and habitat alteration. Of these pollutants, salinity, total dissolved solids, metals, and nutrients are frequently associated with produced water from CBM development. CBM development may also cause flow alterations and associated pollutants to exceed standards (i.e., total suspended solids). MDEQ is conducting a reassessment of the Tongue, Powder, and Little Powder rivers and their tributaries concurrent with this environmental impact study. The results will be used to determine whether TMDLs are necessary for these pollutants and, if so, facilitate development.

In addition, MDEQ intends to ask the Board of Environmental Review (BER) to promulgate numerical standards for electric conductivity (surrogate for total dissolved solids), sodium adsorption ratio (SAR) and bicarbonates. This environmental document proposes a range of numerical criteria for each of these pollutants strictly for the purpose of evaluating the various alternatives. It is important to understand that the BER has the responsibility to set the standards and they will base their decision on written and oral testimony presented at a public hearing and during a public comment period. The stringency of the final standards will determine whether assimilative capacity exists or if a TMDL is necessary.

The court order prohibits MDEQ from issuing any new Montana Pollutant Discharge Elimination System (MPDES) permits or renewals that would increase permitted discharges until all necessary TMDLs are established. In light of the programmatic needs associated with CBM development, MDEQ has rescheduled the TMDLs for pollutants associated with CBM discharges in the Tongue and Powder TMDL planning areas for December 2002. The TMDL completion dates for these planning areas are 2005 and 2006 respectively. However, based upon concerns due to proposed CBM development plans, the MDEQ and EPA are currently developing TMDLs for these streams for SAR and EC.

As mentioned earlier, the court order prohibits MDEQ from issuing any new MPDES permits or renewals that would increase permitted discharges until all necessary TMDLs are established for a particular impaired waterbody. This provision of the court order has a direct bearing on CBM development. Unless producers choose a no discharge option, such as reinjection, MPDES permits will be required for CBM development. MDEQ and EPA are applying the court order on a pollutant-specific basis. For example, if the water is listed for nutrients and the new source will not discharge nutrients, a permit can be issued. Likewise, a permit can be renewed, if an existing source intends to increase its discharge but the effluent limit for nutrients will remain the same. Under some circumstances a permit can be issued even when the new discharge contains the pollutant of concern. By regulation, such permits must contain water quality based effluent limits that insure that the water quality standards will be met downstream of the discharge. For example, if the water quality standard is expressed as an in-stream concentration and the concentration in the discharge is less than the standard, the new source may actually improve water quality.

MDEQ is prohibited from issuing permits for discharges that would cause exceedances of a state water quality standard (i.e., where there is no assimilative capacity). This will be the case for many impaired waterbodies. Therefore, MDEQ will frequently not be able to issue a permit until a TMDL is developed for the entire watershed. A watershed TMDL will identify the major point and non-point sources contributing to the impairment and establish discharge targets for the pollutant of concern. In combination, the limits for all the sources must insure that water quality will improve to the point where the standards are met. The Montana Water Quality Act requires MDEQ to work with local landowners to implement voluntary measures (reasonable land soil and water conservation practices) to reduce pollutant loads from non-point sources. The Act also requires targets for point sources to be incorporated into MPDES permits in the form of effluent limits. The changes would normally be made during the next scheduled permit renewal and could include permits issued between now and the final development of the watershed TMDL. A watershed TMDL may include an allocation for growth to allow for new or increased discharges in the future and facilitate permitting. To provide for growth existing point and non-point sources would need to reduce their discharges even further.

As mentioned earlier, MDEQ advanced the schedule for developing watershed TMDLs for pollutants associated with produced water from CBM development to December 2002. The revised date was selected based upon an assumption that at least one TMDL will be necessary. Developing a TMDL takes time and involves completing the ongoing assessments; coordinating with landowners and CBM producers in Montana, on tribal lands, and perhaps in Wyoming; assigning allocations for point and non-point sources; drafting the TMDL and a technical support document; conducting public meetings; and obtaining EPA approval. If this environmental impact statement is completed on time, the TMDLs will follow six months later. During the interim period MDEQ will review applications for new MPDES permits or renewals on a case-by-case basis. Water quality based effluent limits may be feasible for some discharges while not possible for others. In short, CBM development may be delayed on some waters for an additional six months unless nondischarging options are employed.

## Specific Electrical Conductivity (EC as uS/cm) and Sodium Adsorption Ratio (SAR) Values Proposed for the Tongue, Powder, and Little Powder River Basins and Rosebud Creek

The SAR and EC values in this table are those adopted by the Northern Cheyenne Tribe and the specific values proposed by the parties to the Montana water quality standards process now underway. None of these values has final Clean Water Act (CWA) status, and it is not certain, at this point, what the final CWA values applicable to these Rivers will be. Nevertheless, these SAR and EC values were developed with assistance from advisors with expertise in the area of salinity and sodicity effects on irrigated agriculture. Therefore, it would not be unreasonable to view these values as providing a fair estimate of the range of SAR and EC values which may eventually be judged as providing an appropriate level of protection for irrigated agriculture in these basins. The values are presented here simply to provide the reader with easy link those to the standards development process now underway.

## Specific EC and SAR Values Under Consideration in the Montana Water Quality Standards Process

### *Montana DEQ Option 1*

Montana DEQ has proposed two options to the Board of Environmental Review for consideration as EC and SAR standards. Option #1 proposes a single set of numeric criteria for each River segment.

| **Watershed** | **Irrigation Season (4/1 - 10/31)** | **Non-Irrigation Season (11/1-3/31)** | **Criteria Applicable All Year to All Waters** | | **Notes** |
|---|---|---|---|---|---|
| | EC (max) | EC (max) | SAR (max) | SAR (abs. max) | SAR(max) is the SAR calculated using the ambient EC, for a specific sampling event, in the equation. The calculated SAR is a maximum. SAR(abs. max) is a maximum, not to be exceeded, value that applies to all waters at all times and is based on protecting against the rain-on-sodic-soil event. SAR(abs. max) is 0.5 where EC is less than 350.<br>Montana's WQS proposal includes a range of potential values that could be considered for adoption by the Board. For SAR, the range is - SAR 1 - 10. For EC, the range is 350 - 2500. |
| Tongue River | 1000 | 2000 | EC x 0.0071 - 2.475 | 5.0 | |
| Tributaries to the Tongue River | 500 | | | | |
| Rosebud Creek | 1000 | | | | |
| Tributaries to Rosebud Creek | 500 | | | | |
| Powder River | 1900 | | | | |
| Tributaries to the Powder River | 500 | | | | |
| Little Powder River | 1900 | | | | |
| Tributaries to the Little Powder River | 500 | | | | |

## *Montana DEQ Option 2*

This option is the same as option 1, except for the Tongue River. For the Tongue River, the standards progressively become more stringent from downstream to upstream. This is to protect assimilative capacity in the Montana portion of the River, ensuring the desired level of water quality is attained at the mouth of the River while allowing for development in the upper section of the basin.

| **Watershed** | **Irrigation Season (4/1 - 10/31)** | **Non-Irrigation Season (11/1-3/31)** | **Criteria Applicable All Year to All Waters** | | **Notes** |
|---|---|---|---|---|---|
| | EC (max) | EC (max) | SAR (max) | SAR (abs. max) | SAR(max) is the SAR calculated using the ambient EC, for a specific sampling event, in the equation. The calculated SAR is a maximum. SAR(abs. max) is a maximum, not to be exceeded, value that applies to all waters at all times and is based on protecting against the rain-on-sodic-soil event. SAR(abs. max) is 0.5 where EC is less than 350.<br>Montana's WQS proposal includes a range of potential values that could be considered for adoption by the Board. For SAR, the range is - SAR 1 - 10. For EC, the range is 350 - 2500. |
| Tongue River (Yellowstone R. - N. Cheyenne, northern boundary) | 1000 | 2000 | EC x 0.0071 - 2.475 | 5.0 | |
| Tongue River (N. Cheyenne, northern boundary - southern boundary) | 900 | | | | |
| Tongue River (N. Cheyenne, southern boundary - reservoir inlet) | 700 | | | | |
| Tongue River (reservoir inlet - Wy border) | 600 | | | | |
| Tributaries to the Tongue River | 500 | | | | |
| Rosebud Creek | 1000 | | | | |
| Tributaries to Rosebud Creek | 500 | | | | |
| Powder River | 1900 | | | | |
| Tributaries to Powder River | 500 | | | | |
| Little Powder River | 1900 | | | | |
| Tributaries to the Little Powder River | 500 | | | | |

## *Petitioners[1] Proposal*

This proposal is similar to DEQ's option 2 in that there are multiple standards for each river and the standards become progressively more stringent from downstream to upstream. This proposal also includes multiple irrigation periods at certain locations.

| River Segments and Compliance Locations | EC (max) | SAR (max) | Notes |
|---|---|---|---|
| Tongue River - Wyoming state line | 600 | 0.5 | Applicable dates: all year |
| Tongue River - Reservoir | 800 | 1.0 | Applicable dates: all year |
| Tongue River - at conf. w. Yellowstone R. | 1000 | 1.6 | Applicable dates: 4/1 - 10/31 |
| Tongue River - at conf. w. Yellowstone R. | 1200 | 2.5 | Applicable dates: 11/1 - 3/31 |
| Rosebud Creek - Kirby | 700 | 1.0 | Applicable dates: all year |
| Rosebud Creek - Colstrip | 1300 | 1.5 | Applicable dates: all year |
| Rosebud Creek - at conf. w. Yellowstone R. | 1700 | 3.0 | Applicable dates: all year |
| Powder River - Moorhead | 1400 | 4.0 | Applicable dates: 4/15 - 7/15 |
| Powder River - Moorhead | 2200 | 5.0 | Applicable dates: 7/16 - 9/1 |
| Powder River - Moorhead | 3000 | 6.0 | Applicable dates: 9/2 - 4/14 |
| Powder River - at conf. w. Yellowstone R. | 1600 | 4.0 | Applicable dates: 4/15 - 7/15 |
| Powder River - at conf. w. Yellowstone R. | 2400 | 5.0 | Applicable dates: 7/16 - 9/1 |
| Powder River - at conf. w. Yellowstone R. | 3200 | 6.0 | Applicable dates: 9/2 - 4/14 |
| Little Powder - Biddle | 2000 | 5.0 | Applicable dates: 4/15 - 7/15 |
| Little Powder - Biddle | 2400 | 6.0 | Applicable dates: 7/16 - 9/1 |
| Little Powder - Biddle | 3000 | 8.0 | Applicable dates: 9/2 - 4/14 |

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[1] "Petitioners" include -Tongue River Water Users, T&Y Irrigation District, Buffalo Rapids Irrigation Project, and Northern Plains Resource Council.

## *WQS for Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) Adopted by the Northern Cheyenne Tribe*

The Northern Cheyenne Tribe's EC and SAR numerical standards were adopted by the Tribal Council on May 28, 2002. The numerical standards apply to the Tongue River, Rosebud Creek and tributaries to each within the boundaries of the Reservation.

| **Tongue River and Rosebud Creek (within the Reservation Boundaries)** | **Irrigation Season (4/1 - 11/15)** | **Criteria Applicable All Year** | | **Notes** |
|---|---|---|---|---|
| | EC (30-day ave.) | EC (inst. max.) | SAR (inst. max.) | The Tribe has also adopted indicator values for total dissolved solids (TDS) that will be used to monitor conditions and trends of these waters. |
| Southern Boundary | 1000 | 2000 | 2.0 | |
| Northern Boundary | 1500 | 2000 | 3.0 | |
| Tributaries | 1500 | 2000 | 3.0 | |

# MONTANA AND WYOMING POWDER RIVER INTERIM WATER QUALITY CRITERIA MEMORANDUM OF COOPERATION

WHEREAS, the State of Montana and the State of Wyoming recognize a. responsibility and an opportunity to work collaboratively to protect water quality in the Powder River Basin and to facilitate the development of Coal Bed Methane (CBM) activities in the respective states, and

WHEREAS, the State of Montana and the State of Wyoming will pursue a process that would establish respective responsibilities for managing and controlling salinity, SAR, and other pollutants of concern; and

WHEREAS, the States of Montana and Wyoming have met in several meetings to work out the technical details of this cooperative approach; and

WHEREAS, the State of Montana and the State of Wyoming realize that an interim effort is necessary until more stream flow and water quality data can be collected and analyzed to determine the assimilative capacity of waters in the Powder River drainage, and until the effects of CBM development are better known, and Montana completes the development and adoption of water quality standards, an EIS and a Total Maximum Daily Load (TMDL) plan for the basin; and

WHEREAS, the State of Wyoming recognizes Montana's downstream interests and has committed to apply certain limits on the development of CBM activities, during the term of this cooperative effort; and

WHEREAS, the State of Montana has recognized Wyoming's desire to continue to cautiously grant NPDES permits during this interim period; and

WHEREAS, the State of Wyoming will work with and support Montana's efforts to develop long-term water quality standards and an equitable allocation of the assimilative capacity if one exists.

NOW THEREFORE, the parties enter into this Memorandum of Cooperation (MOC).

## I. Parties.

The parties to this MOC are the signatories as set forth on Page 4. The director of the Wyoming Department of Environmental Quality is entering into this MOC to further the purposes of the Wyoming Environmental Quality Act, W.S. 35-11-109(a)(ii). The director of the Montana Department of Environmental Quality is entering into the MOC to further the purposes of – the Montana Water Quality Act, Title 75, Chapter 5, Montana Code Annotated.

## II. Purpose of MOC

The purpose of this MOC is to document the parties' commitments and their intent to protect and maintain water quality conditions within Montana during an interim period while new CBM discharges in Wyoming are cautiously allowed. At the conclusion of this interim period, the parties shall negotiate a final MOC that will include recognition of protective water quality standards and allocation of any assimilative capacity.

## III. Interim Threshold Criteria for Salinity and Sodium

### 1. Powder River

The two states will use the highest sampled monthly values of electrical conductivity (EC) from 1990 through 1999 for the Powder River at the Moorhead gauging station as interim upper threshold criteria. Montana shall monitor the Moorhead data and report to Wyoming the average monthly EC and its comparability to the appropriate monthly value. If in any given month the average EC exceeds the threshold criteria, as listed herein, Wyoming will use its ongoing monitoring of sodium levels to determine the potential source and cause of the exceedance. The results of this investigation will be reported to Montana in a timely manner. If the exceedance is found to be attributable to CBM discharges, Wyoming will initiate appropriate steps through its regulatory mechanisms to return salinity levels into conformity with this MOC.

The Upper Threshold Salinity Monthly Values (EC in pmhos/cm) for the Powder River at the Moorhead, Montana gauging station, based on the data from the 1990's are:

January 2200
February 2300
March 2300
April 1700
May 2100
June 2200
July 2800
August 2400
September 2600
October 1900
November 2000
December 1800

The two states recognize that sodium levels and the Sodium Adsorption Ratio (SAR) may have an effect on water uses. However, at this time no clear threshold can be developed due to a lack of data. The State of Wyoming will, through its monitoring program, track sodium concentrations in the Powder River above the state line, evaluate the source of changes through various modeling techniques and report the results of these evaluations to Montana.

### 2. Little Powder River

The states will use statistical step tests and 90" percentile, 90% confidence limits (90/90) for EC, SAR, and Total Dissolved Solids (TDS) derived from monthly flow weighted historic data as threshold criteria to indicate whether a change has occurred. Montana shall monitor the data from the Little Powder above Dry Creek, near Weston, and report the flow-weighted results to Wyoming. The step tests and 90/90 criteria will be based on a continuous and cumulative evaluation of available data from 1985 forward. Pre-1985 data will not be used because baseline conditions delineated by the older data sets differ from post-1984 conditions. If a step test shows a significant difference or the 90/90 confidence limit is exceeded, Wyoming will conduct an evaluation as to the possible source of the trend or exceedance and report the results to Montana in a timely manner. If the difference or exceedance is found to be attributable to CBM discharges, Wyoming will initiate appropriate steps through its regulatory mechanisms to return salinity levels into conformity with this MOC.

## IV. Other Pollutants of Concern

Montana accepts Wyoming's antidegradation policy as protective of Montana's water quality standards. However, should Wyoming consider an application to degrade, Montana will be included as a participant in the waiver review process so that the states may equitably allocate any assimilative capacity.

## V. Monitoring Program

Wyoming and Montana are committed to the development of a monitoring program to implement this MOC and to the development of a final MOC.

## VI. Standard Frequency of Data Review and Evaluation

The parties will meet periodically and review the results of their respective monitoring programs, to promptly report evaluations and results, and review the overall success of the program.

## VII. Term of MOC

It is the intent of the parties that this interim MOC is for a period of 18 months from its' effective date. During the fall of 2002 the parties anticipate re- negotiating a final MOC that will address meeting downstream standards for the Powder and Little Powder Rivers and TMDLs.

VIII. Public Participation

Opportunity for public participation was provided during the technical sessions that led up to this MOC. The parties are committed to keeping the public informed about the implementation and success of this MOC. All technical information and evaluations resulting from this MOC will be available to the public.

IX. Dispute Resolution

The parties agree that disputes that arise as a result of this MOC shall be resolved through communication and cooperative problem solving involving the parties

X. Amendment

This MOC may be amended or modified at any time upon the consent of all parties.

XI. Vacating MOC

Any party may withdraw from this MOC by providing written notice to the other parties.

XII. Effective Date

This MOC is effective upon the last date of signature by a party, as listed below.

1. MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Jan Sensibaugh, Director Sept. 5, 2001

2. WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

Dennis Hemmer, Director Date

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# GENERAL DISCHARGE PERMIT
# COAL BED METHANE PRODUCED WATER

## MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

## AUTHORIZATION TO DISCHARGE UNDER THE

## MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with Section 75-5-101 et seq., MCA, and ARM Title 17, Chapter 30, Subchapters 6, 7, 12, and 13. Owner or operators of coal bed methane point sources are authorized to discharge produced water resulting from natural gas production wells to holding ponds for the purpose of the prescribed beneficial use. Discharges to other any other state water is not authorized except in conformance with the terms and conditions of this permit and an accompanying letter of authorization. The use of holding ponds for the prescribed beneficial use shall be in accordance with effluent limitations, monitoring requirements, and other conditions set forth herein. A written authorization letter from the Department is required before an applicant is authorized to discharge under the Coal Bed Methane Produced Water-General Permit.

This permit shall become effective on the date of issuance.

This permit and the authorization to discharge shall expire at midnight, 5 years after the date of issuance.

FOR THE MONTANA DEPARTMENT OF
ENVIRONMENTAL QUALITY

______________________________
Jan P. Sensibaugh, Director
Department of Environmental Quality

Dated this _______day of ______________

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## I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

### A. Definitions.

1. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

2. "Department" means the Montana Department of Environmental Quality.

3. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

4. "Instantaneous Maximum" is the maximum value allowable in any single sample or instantaneous measurement.

5. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

6. "Petroleum-related water cleanup" is groundwater or collected stormwater in contact with petroleum-related spills or leaking underground storage tanks that contain petroleum-related products.

7. "Coal Bed Methane Produced Water" is the separated wastewater resulting from coal bed methane natural gas producing wells.

8. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

9. "Ephemeral Stream" means a stream or a part of a stream, which flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice and whose channel bottom is always above the local water table.

10. "Intermittent Stream" means a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface run-off and groundwater discharge.

11. “Continuous” is the measurement of effluent flow, which occurs without interruption throughout the operating hours of the facility, except for infrequent shutdowns for maintenance process changes, or other similar activities.

### B. Effluent Limitations and Self-Monitoring Requirements

During the period beginning immediately and lasting through the duration of the permit, the permittee is authorized to discharge from the outfall(s) as specified in the authorization letter. Discharges at any location not authorized under an MPDES permit is a violation of the Montana Water Quality Act and could subject the person(s) responsible for such discharge to penalties under the Act. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge within a reasonable time from first learning of an unauthorized discharge could subject such person to criminal penalties as provided under Section 75-5-632 of the Montana Water Quality Act.

No discharge is authorized by this general permit to state surface waters other than holding ponds created for the purpose of the prescribed beneficial use.

1. Final Wastewater Effluent Limitations

Effective immediately and lasting through the present permit cycle of five years, the quality of effluent discharged through the authorized outfall shall, as a minimum, meet the limitations as set forth in Table 1 below:

**TABLE 1: FINAL NUMERIC EFFLUENT LIMITATIONS**

| **Parameter** | **Semiannual Average** |
|---|---|
| Total Dissolved Solids (TDS) | 2,500 |
| Selenium | 0.005 |
| pH, Standard Units @ 25°C | 6.5 – 9.0 |
| Oil and Grease, total recoverable (2) | 10 |

(1) See the definitions in Part I.A. of the permit.

(2) Hexanes extraction (EPA Method 1664A)

2. Other Conditions

a. Impoundments constructed for the purposes of holding CBM produced water shall not cause excessive salinity of underlying soils. If the soil salinity, as measured by electrical conductivity (EC) in a paste extract, exceeds 20 millimhos/cm in the impoundment sediments, a reclamation plan must be submitted to the Department and landowner to ensure the land is returned to its previous utility and stability. A sample must be collected whenever the annual average TDS exceeds 5,000 mg/L.

b. Impoundments constructed for the purposes of holding and storing produced water from CBM development must not be located in ephemeral, intermittent, or perennial drainages as defined in Section I.A of the permit or the alluvial deposits underlying floodplains and terraces of these drainages. For purposes of this permit, ephemeral, intermittent, or perennial streams are those identified as such on a 7.5-minute U.S. Geological Survey topographic map.

c. There shall be no discharge of water from the impoundment except whenever rainfall events, either chronic or catastrophic, cause an overflow of water from the impoundment designed, constructed, and operated to contain a normal volume of produced water plus runoff from a 25-year, 24 hour precipitation event.

d. An impoundment constructed for the purposes of this permit shall be designed, constructed, and operated such that an amount of "freeboard" or available volume in the impoundment will be maintained at all times to retain the volume of water resulting from a 25-year, 24 hour precipitation event. Freeboard must be based on the surface area of the impoundment and all those areas that contribute runoff to the impoundment.

e. A map showing the 25-year, 24-hour rainfall for Montana is given in Attachment A to the permit. The 25-year, 24-hour event for the location of the CBM produced water impoundment structure covered by this permit must be determined from this map.

f. For purposes of determining compliance with the effluent limitations of this permit, the amount of precipitation that occurred must be based on the data from the nearest weather station with a precipitation gauge. The permittee has the option of maintaining a functional and reliable precipitation gauge at the facility. See Attachment B for a map of weather stations in Montana.

g. The permittee shall monitor the quality of the water in the impoundment for the parameters and at the frequency listed in Table 3. If the quality of the water, based on the annual average, exceeds the recommended maximum levels listed in Table 4, the permittee shall cease discharging to the impoundment and submit a plan to the Department to dispose of the water in the impoundment.

h. Impoundments constructed for the disposal of produced water under this general permit shall be located where the depth to groundwater is greater than fifty (50) feet.

i. The operator authorized under this permit shall operator and maintain the permit in conformance with the approved Water Management Plan in Part V of this permit.

3. Self-monitoring Requirements

As a minimum, upon the effective date of this permit, the following constituents shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge. If no discharge occurs during the entire monitoring period, it shall be stated on the Discharge Monitoring Report Form (EPA No. 3320-1) that no discharge or overflow occurred.

A. Effluent Monitoring

The permittee shall sample the quality of the effluent from each source discharging to the impoundment for the parameters and at the frequency listed in Table 2. The results of these analyses shall be reported to the Department according to the procedures in Part II of the permit.

**TABLE 2: EFFLUENT MONITORING REQUIREMENTS**

| **Parameter** | **Frequency** | **Type** (1) |
|---|---|---|
| Effluent Flow, gallons (2) (4) | Continuous | Continuous (4) |
| Total Dissolved Solids (TDS), mg/L | Semiannual | Grab |
| Specific Conductance, umhos/cm | Semiannual | Grab |
| pH, standard units | Semiannual | Instantaneous |
| Selenium, mg/L | Semiannual | Grab |
| Oil and Grease, mg/L (3) | Semiannual | Grab |

(1) See the definitions in Part I.A. of the permit.

(2) If no discharge occurs during the reporting period, **"no discharge"** must be recorded on the DMR form. Flow from all sources contributing produced water to the constructed pond must be recorded on a continuous basis by either a recording device or tantalizer.

(3) Hexanes extraction (EPA Method 1664A)

(4) The flow reported shall be reported as the total volume over the monitoring period.

B. Impoundment Monitoring

The permittee shall sample the quality of the water in the storage impoundment for the parameters and at the frequency listed in Table 3. The results of these analyses must be reported to the Department according to the procedures in Part II of the permit.

**TABLE 3: IMPOUNDMENT MONITORING REQUIREMENTS**

| **Parameter** | **Frequency** | **Type** (1) |
|---|---|---|
| Impoundment Freeboard, feet (2) | Monthly | Instantaneous |
| Total Dissolved Solids (TDS), mg/L | Semiannual | Grab |
| Total Suspended Solids (TSS), mg/L | Semiannual | Grab |
| Specific Conductance, umhos/cm | Semiannual | Grab |
| pH, standard units | Semiannual | Instantaneous |
| Oil and Grease, mg/L (3) | Semiannual | Grab |
| Total Alkalinity, (as $CaCO_3$) mg/L | Semiannual | Grab |

**TABLE 3: IMPOUNDMENT MONITORING REQUIREMENTS**

| **Parameter** | **Frequency** | **Type** (1) |
|---|---|---|
| Bicarbonate, mg/L | Semiannual | Grab |
| Calcium, mg/L | Semiannual | Grab |
| Chloride, mg/L | Semiannual | Grab |
| Nitrate+Nitrite ($NO_3$+$NO_2$) as N, mg/L | Semiannual | Grab |
| Potassium, mg/L | Semiannual | Grab |
| Radium 226, 228, picocuries/L | Semiannual | Grab |
| Radon 222, picocuries, L | Semiannual | Grab |
| Sodium, mg/L | Semiannual | Grab |
| Sulfate, mg/L | Semiannual | Grab |
| Arsenic, mg/L | Semiannual | Grab |
| Beryllium, total recoverable, mg/L | Semiannual | Grab |
| Lead, total recoverable, mg/L | Semiannual | Grab |
| Magnesium, mg/L | Semiannual | Grab |
| Selenium, mg/L | Semiannual | Grab |
| Iron, mg/L | Semiannual | Grab |
| Barium, mg/L | Semiannual | Grab |
| Sodium Adsorption Ration (SAR) | Semiannual | Calculated |

(1) See the definitions in Part I.A. of the permit.

(2) If no discharge occurs during the reporting period, **"no discharge"** must be recorded on the DMR form.

(3) Hexanes extraction (EPA Method 1664A)

The owner or operator of the impoundment must conduct monthly inspections of the impoundment to check for structural integrity. The inspection shall be conducted to determine if a discharge is occurring, has occurred since the previous inspection, and/or if a discharge is likely to occur before the next inspection. The inspection will determine if proper operation and maintenance procedures are being undertaken at the impoundment.

The permittee shall maintain a logbook recording information obtained during the inspection. The logbook shall be kept in accordance with proper record-keeping procedures and shall be available for inspection. At a minimum, the logbook shall include the following information:

1. Date and time of the inspection;
2. Name(s) of the inspector(s);
3. Impoundment's discharge status;
4. Measured amount of freeboard;
5. Identification of operation and/or maintenance problems;
6. Remedies needed to address the identified problems;
7. Any actions taken with regard to the problems;
8. Other information, as appropriate.

## II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

### A. Representative Sampling.

Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the wastewater prior to discharging from the permittee's property. Samples and measurements shall be representative of the volume and nature of the monitored discharge.

### B. Monitoring Procedures.

Monitoring must be conducted according to test procedures approved under Part 136, Title 40 of the Code of Federal Regulations, unless other test procedures have been specified in this permit. All flow-measuring and flow-recording devices used in obtaining data submitted in self-monitoring reports must indicate values within 10 percent of the actual flow being measured.

### C. Penalties for Tampering.

The Montana Water Quality Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $25,000, or by imprisonment for not more than six months, or both.

### D. Reporting of Monitoring Results.

Results of the self-monitoring shall be reported semiannually on the Discharge Monitoring Report form (EPA 3320-1) to the Department (see address below), postmarked no later than the 28th day of the month following the reporting period; the due date of the first semiannual report is July 28th and the second semiannual report is January 28th.

Montana Department of Environmental Quality
Water Protection Bureau
P.O. Box 200901
Helena, Montana 59620-0901
Phone: (406) 444-3080

All reports, notifications and inquires regarding the conditions of this permit shall be submitted to the Department at the above address.

### E. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using approved analytical methods as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

### F. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The initials or name(s) of the individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The time analyses was initiated;
5. The initials or name(s) of individual(s) who performed the analyses;

6. References and written procedures, when available, for the analytical techniques or methods used; and,

7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results.

G. Retention of Records.

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of sample, measurement, report or application. This period may be extended by request of the Department at any time.

H. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall report any noncompliance, which may endanger health or the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Quality Division at (406) 444-3080.

2. The following occurrences of noncompliance shall be reported by telephone to the Water Quality Division at (406) 444-3080 by the first workday (8:00 A.M.- 4:30 P.M. Mountain Time) following the day the permittee became aware of the circumstances any unanticipated bypass which exceeds any effluent limitation in the permit (See Part III.G., Bypass of Treatment Facilities.);

3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

4. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Quality Division, by phone, (406) 444-3080.

5. Reports shall be submitted to the addresses in Part II.D., Reporting of Monitoring Results.

I. Other Noncompliance Reporting.

Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D. are submitted. The reports shall contain the information listed in Part II.H.3.

J. Inspection and Entry

The permittee shall allow the head of the Department or the Regional Administrator, or authorized representative thereof, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance, any substances or parameters at any location.

## III. COMPLIANCE RESPONSIBILITIES

### A. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Department advance notice of any planned changes at the permitted facility or of an activity, which may result in permit noncompliance.

B. Penalties for Violations of Permit Conditions. The Montana Water Quality Act provides that any person who violates a permit condition of the Act is subject to a civil penalty not to exceed $25,000 per day or one year in prison, or both, for the first conviction, and $50,000 per day of violation or by imprisonment for not more than two years, or both, for subsequent convictions. Except as provided in permit conditions on Part III.G., Bypass of Treatment Facilities, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

### C. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

### D. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment.

### E. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures.

### F. Removed Substances

Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard.

### G. Bypass of Treatment Facilities:

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2. and 3. of this section.

2. Notice:

   a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 10 days before the date of the bypass.

   b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.I., Twenty-four Hour Reporting.

3. Prohibition of bypass.

a. Bypass is prohibited and the Department may take enforcement action against a permittee for a bypass, unless:

(1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and,

(3) The permittee submitted notices as required under paragraph 2. of this section.

b. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in paragraph 3.a. of this section.

## IV. GENERAL REQUIREMENTS

### A. Planned Changes

The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of pollutant discharged. This notification applies to pollutants, which are not subject to effluent limitations in the permit.

### B. Anticipated Noncompliance

The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

### C. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

### D. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application form and fee should be submitted at least 180 days before the expiration date of this permit.

### E. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

### F. Other Information

When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information.

### G. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified.

1. All permit applications shall be signed as follows:

    a. For a corporation: by a responsible corporate officer;

    b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;

    c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Department, and,

   b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph IV.G.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph IV.G.2. must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports

The Montana Water Quality Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $25,000 per violation, or by imprisonment for not more than six months per violation, or both.

I. Availability of Reports

Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by the Clean Water Act, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

K. Property Rights or Water Rights

The issuance of this permit does not convey any property or water rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

The permittee and adjacent landowner using produced water must comply with applicable water rights statutes under MCA, 85-2-306, before any beneficial water use commences. Information and assistance on the water rights statutes can be obtained from the Department of Natural Resources and Conservation, Water Resources Division at (406) 444-6601.

L. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers

This permit cannot be transferred to a new permittee. A new owner or operator of a facility must apply according to the application procedures in Part IV.D of this permit 30 days prior to taking responsibility for the facility.

N. Fees

The permittee is required to submit payment of an annual fee as set forth in ARM 17.30.201. If the permittee fails to pay the annual fee within 90 days after the due date for the payment, the Department may:

1. Impose an additional assessment consisting of 15% of the fee plus interest on the required fee computed at the rate established under 15-31-510(3), MCA, or

2. Suspend the processing of the application for a permit or authorization or, if the nonpayment involves an annual permit fee, suspend the permit, certificate or authorization for which the fee is required. The Department may lift suspension at any time up to one year after the suspension occurs if the holder has paid all outstanding fees, including all penalties, assessments and interest imposed under this sub-section. Suspensions are limited to one year, after which the permit will be terminated.

O. Reopener Provision

This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary), or other appropriate requirements if one or more of the following events occurs:

1. Water Quality Standards:

   The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.

2. Wasteload Allocation:

A wasteload allocation is developed and approved by the Department and/or EPA for incorporation in this permit.

3. Water Quality Management Plan:
A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit.

## V. SPECIAL REQUIREMENTS

A. Authorization Letter. A written authorization letter from the Department is required before an applicant is authorized to discharge under the Coal Bed Methane Produced Water General Permit.

B. The following prerequisites must be met before an applicant can be authorized to discharge under the CBMPW-GP.

1. The applicant shall submit a current beneficial use letter from the surface landowner(s) stating the discharged produced water will be used for wildlife or livestock watering. Landowners that receive CBM produced water must request the water and document its beneficial use.

2. The applicant shall submit a water management plan in accordance with Part V.C of this permit. The water management plan shall address all coal bed methane development in a watershed. Operators permitted under this general permit must implement the provisions of the Water Management Plan. The operator shall amend the plan whenever there is a significant change in the design, construction, operation or maintenance of the components of the plan. The Department may notify the operator that plan does not meet one or more of the minimum requirements of this permit. After such notification the operator shall make such changes to the plan an provide an updated plan to the Department. Unless otherwise provided by the Department, the operator shall have 30 days after such notification to make the required change.

3. The applicant shall submit a chemical analysis of the proposed discharge from a location representative of the quality of water being proposed for discharge for the parameters specified in Table 4 below. The sample must be collected from the closest available existing source within a twenty-mile radius of the proposed site and from the same coal formation and the same approximate depth. The analysis must be conducted in accordance with approved EPA test procedures (40 CFR 136 or 40 CFR 136.5). No authorization to discharge will be given if the analysis indicates that the parameters exceed any of the maximum levels in Table 4.

**TABLE 4: MAXIMUM LEVELS AND MONITORING REQUIREMENTS**

| **Parameter** | **Type** (1) | **Maximum Levels** | **Required Detection Level** |
|---|---|---|---|
| Effluent Flow Rate (2), gpm | Instantaneous | NA | NA |
| Total Dissolved Solids (TDS), mg/L | Grab | 2,500 | 1 mg/L |
| Total Suspended Solids (TSS), mg/L | Grab | None | 1 mg/L |
| Specific Conductance, µmhos/cm | Grab | 3,000(2) | 5 µmhos/cm |
| pH, standard units | Grab | 6 –9 | 0.1 standard units |
| Oil and Grease, mg/L(6) | Grab | 10 | 1 mg/L |
| Total Alkalinity, (as $CaCO_3$) mg/L | Grab | 2,000(2) | 1 mg/L as $CaCO_3$ |
| Bicarbonate, mg/L | Grab | 1,000(2) | 1 mg/L |
| Calcium, mg/L | Grab | 1,000(2) | 0.1 mg/L |
| Nitrate+nitrite ($NO_3$+$NO_2$) as N, mg/L | Grab | 100(3) | 0.01 mg/L |

**TABLE 4: MAXIMUM LEVELS AND MONITORING REQUIREMENTS**

| **Parameter** | **Type** [1] | **Maximum Levels** | **Required Detection Level** |
|---|---|---|---|
| Radium 226 228, picocuries/L | Grab | 1 pCi/L[2] | 0.2 pCi/L |
| Radon 222, picocuries/L | Grab | 1 pCi/L[2] | 0.2 pCi/L |
| Sodium, mg/L | Grab | 800[2] | 0.2 mg/L |
| Sulfate, mg/L | Grab | 2500[4][5] | 6 mg/L |
| ARSENIC, TOTAL RECOVERABLE, MG/L | Grab | 0.2-0.5[2] | 0.003 mg/L |
| ***Beryllium, total recoverable, mg/L*** | Grab | 1[2] | 0.001 mg/L |
| Selenium, total recoverable, mg/L | Grab | 0.05[2] | 0.001 mg/L |
| Iron, mg/L | Grab | 10[7] | 0.010 mg/L |
| Barium, mg/L | Grab | 20[8] | 0.005 mg/L |
| Boron, mg/L | Grab | 2[9] | 0.1 mg/L |
| Sodium Adsorption Ratio (SAR) | Calculated | None | NA |

(1) See the definitions in Part I.A. of the permit.

C. Water Management Plan. The applicant shall submit a Water Management Plan (WMP) addressing the following items:

1. A cover letter identifying the Water Management Plan and the watershed(s) affected by the project.

2. A 7.5-minute topographic map showing the exact location of the impoundment and identifying all sources and volumes of water and wastewater that contribute to the impoundment. The map must identify all surface waters and groundwater wells within a 1-mile radius of the impoundment.

3. Anticipated rate of water production per well and the calculated amount of annual water production for the field. The applicant must submit a line drawing showing the location of the proposed CBM produced water impoundment, CBM produced water wells, collection system, inlet and outfall structure, and sample locations for both the produced water wells and the impoundments. The design capacity and surface area of the impoundment and narrative discussion of storm water management controls.

4. The applicant must submit a soil survey and map for all areas disturbed by the impoundment. The soil survey must include the type of survey used and a detailed description of the soil types present, parent material, and development (based on National Cooperative Soil Survey) and an analysis of the soil texture, pH, EC, SAR, porosity and permeability.

5. The applicant will provide documentation showing that there is not a direct subsurface hydrologic connection from the impoundment to surface waters of the state and the depth to ground water is greater that 50 feet in the vicinity of the impoundment. If the applicant cannot establish that a direct subsurface hydrologic connection to surface waters does not exist, downgradient monitoring wells the Department may require the installation of monitoring wells downgradient of the impoundment.

6. A proposed surface water monitoring plan for the watershed in which the impoundment is located. The WMP shall propose the location and procedures (collection, QA/QC) for sampling the most downgradient perennial stream in the watershed in which the impoundment is located and within 1 mile of the next downstream waterbody. An annual grab sample shall be collected and analyzed for the constituents specified in Table 4. The sample should be collected during the annual base flow period. The Department may waive this requirement on a case-by-case basis if the applicant demonstrates that a sampling program already exists such as when multiple impoundments are located in the same watershed.

THE STATE OF WYOMING

**JIM GERINGER**
GOVERNOR

**Department of Environmental Quality**

Herschler Building ● 122 West 25th Street ● Cheyenne, Wyoming 82002

| ADMINISTRATION | ABANDONED MINES | AIR QUALITY | INDUSTRIAL SITING | LAND QUALITY | SOLID & HAZARDOUS WASTE | WATER QUALITY |
|---|---|---|---|---|---|---|
| (307) 777-7758 | (307) 777-6145 | (307) 777-7391 | (307) 777-7368 | (307) 777-7756 | (307) 777-7752 | (307) 777-7781 |
| FAX 777-7682 | FAX 634-0799 | FAX 777-5616 | FAX 777-6937 | FAX 634-0799 | FAX 777-5973 | FAX 777-5973 |

# Updated Permitting Options
# for Coal Bed Methane Permit Applications

Revised: December 10, 2001
by Gary Beach, Administrator, WQD

This information is being provided to replace of the October 29, 1999 memorandum from Gary Beach regarding permitting options and the August 4, 2000 memorandum on assessing irrigation suitability. As a result of revisions to Wyoming Water Quality Rules and Regulations, Chapter 1 (July 2001) and other department actions such as the formalization of the agreement with the State of Montana regarding discharges to the Powder and Little Powder Rivers, the older guidance is no longer appropriate. The information contained in this document is provided to give basic guidance on completing applications for coal bed methane discharge permits. Supplemental information is also provided in a memo from Gary Beach dated September 20, 2001 and applicants should also use the most current CBM permit application form for guidance. Major changes in recent permitting approaches include the following:

- Points of Compliance (POCs) no longer need be specified in applications, unless an applicant wants to retain a downstream POC;
- Main-stem mixing analyses are no longer required, however applicants proposing discharges into the Powder River drainage (Option 2) will be encouraged to utilize water management techniques that minimize the quantity of water that reaches the main-stem;
- Samples for aquatic life limited constituents, except for aluminum and selenium, are to be analyzed for dissolved constituents instead of acid soluble portion. Aluminum and selenium should be analyzed for their total recoverable form;
- SAR and irrigation-based specific conductance limits will not be included in permits for discharges to the Powder and Little Powder rivers except where existing irrigation diversions exist within tributary systems receiving effluent prior to confluence with main stem water bodies; (See recent instruction memo from Gary Beach dated November 19, 2001.)

- Aquatic life based effluent limits will be applied to closed basin systems (Option 1B) except where a use attainability analysis has been conducted that supports the reclassification of the system to a class 4c water; and

- Water balances are needed to illustrate total containment (non-discharging for off-channel or closed basin) reservoir systems. Water balances may not be necessary for on-channel reservoirs except where on-tributary irrigation exists and the blending of effluent with precipitation runoff is necessary to achieve irrigation suitability.

Revised Permitting Options

The following represent the revised options for the various site-specific configurations for discharge. The applicant should indicate within the application package the option being selected.

Option 1A - This option is reserved for facilities where discharge will be to reservoirs constructed in upland areas where there is no potential for stormwater runoff to enter the reservoir, the reservoir is not located in a drainage or alluvial deposit of a drainage, and the reservoir will be constructed such that no surface discharge from the reservoir will occur. Effluent limits will be established in permits for these facilities which are protective of the livestock and wildlife uses. A water balance should accompany the application to demonstrate that water losses attributable to infiltration and evaporation are at least equivalent to the predicted discharge rate plus the volume of water that would enter the reservoir (i.e., fall directly onto the surface of the reservoir and some minor contribution of surface runoff around the pond) during a 100-year/24-hour storm event. The siting of these reservoirs must also assure that there will not be a direct subsurface hydrologic connection to surface waters. If there are questions about this subsurface connection, then certain types of geologic information or shallow groundwater monitoring may be necessary.

Option 1B - This option is reserved for facilities where discharge will be to reservoirs constructed in closed class 3 basins. Closed basins are drainages that terminate in playas or depressions (also class 3) that have no outlets to drainage systems of the state. This option is available when a reservoir constructed in such a basin is designed such that no discharge from the reservoir will occur. Effluent limits will be established in permits for these facilities that are protective of the livestock and wildlife uses specified in the application, and aquatic life. A water balance must accompany the application to demonstrate that water losses attributable to infiltration and evaporation are at least equivalent to the predicted flow rate plus the volume of water that would enter the basin from the drainage area during a 100-year/24-hour storm event. If there are downstream irrigation water rights within the closed basin, this option may not be applicable or effluent limits for SAR and Electric Conductivity may have to be set. The permit application should include information concerning hydrologic connection in the closed basin if downstream irrigation exists.

Option 2 - This option is for facilities which discharge into drainages that are class 2 or are tributary to class 2 water systems, regardless of whether a reservoir(s) is being proposed for construction within the drainage. Effluent limits will be established in permits for these facilities that are protective of:

1. The basic designated uses of agricultural and wildlife;
2. Aquatic life protection in Class 3 drainages unless a UAA has been done to justify the drainage as a Class 4 and;

3. Aquatic life, fisheries, and human health if the discharge water could reach Class 2 or 3 drainages.

For discharges into the Belle Fourche or Cheyenne River drainages, effluent limits of 2000 umhos/cm for specific conductance and 10 for SAR have been established as protective. These limits may only be increased where the applicant provides a demonstration of why alternate effluent limits will provide adequate protection of irrigation uses.

For discharges to the Powder River and Little Powder River systems, if irrigation existed before CBM development on a tributary where discharge is occurring, effluent limits for SAR and specific conductance and/or additional permit conditions will be included to protect the downstream irrigation practices.

Option 2 Evaluation of Downstream Irrigation Practices.

For Option 2 discharges into tributaries of the Powder or Little Powder River, where downstream irrigation activities existed before CBM development, applicants shall be expected to develop an irrigation use protection plan that meets, but is not limited to at least one of the following concepts:

(1) Meet at the first downstream point of diversion or use, the representative baseline specific conductance and SAR values of the main-stem;
(2) Meet at the first downstream point of diversion or use, the representative baseline specific conductance and SAR values on the tributary system;
(3) Provide a demonstration that change in specific conductance and SAR levels at the point of diversion or use resulting from CBM discharge can be tolerated by the soils and crops without a significant reduction in crop productivity;
(4) Provide a plan to segregate CBM discharge from natural runoff or obtain zero flow at the point of diversion during the irrigation season and to avoid adverse effects during the non-irrigation season.

The information necessary to support an irrigation use protection plan may vary with the approach selected above, but should include consideration of the following elements:

(1) An evaluation of traditional irrigation practices and the ability of the discharge water to meet representative main-stem or tributary values at point of diversion or use;
(2) If applicable, development of critical information about the most sensitive soils and crops on downstream irrigated lands;
(3) A description of the changes that may have to occur in traditional irrigation practices to implement the plan;
(4) A description of all entities that must share in implementation of the plan;
(5) If necessary, a monitoring plan to gauge changes on irrigated areas and make adjustments before substantial adverse effects may result.

It is DEQ's desire to be consistent in setting permit limits for operations in a common sub-watershed. To promote consistency, requirements will be applied consistently within the options selected to protect downstream irrigation activities.

It is highly recommended that operators contact the appropriate WDEQ staff member (see final paragraph) to discuss the type of information that will be needed to support a site specific approach for protecting irrigation if you wish to pursue something different from the permit limits for irrigation protection on the Belle Fourche or Cheyenne River drainages, or for Powder or Little Powder River basins where irrigation diversions are present within the tributary.

Discharges to Tongue River

For discharge proposals into the Tongue River drainage, until such time as an agreement is formulated with Montana and the Tribes regarding discharges to the Tongue River, alternatives under which permitting can be considered include Options 1A and 1B, unless the quality of water discharged into the Tongue River system is similar to the quality of water in the Tongue River.

Contacts:

If further information is needed, please contact Kathy Shreve (307- 777-7543) or Jason Thomas (307-777-5449) for assistance in completing applications; Eric Hargett at (307-777-6682) for information on permit conditions for discharges in the Powder, Little Powder or Tongue River Basins; or Becky Peters at (307-777-6354) for information on permit conditions for discharges in the Belle Fourche or Cheyenne River basins. For general information on permit status, you can contact Becky Peters at email: bpeters@state.wy.us.

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# MINERALS APPENDIX

# MINERALS APPENDIX

## Introduction

The *Minerals Appendix* contains a discussion of coal bed methane (CBM) in the emphasis area's, conventional oil and gas production trends, the Reasonably Foreseeable Development Scenario (RFD), and a description of the cumulative effects projects evaluated for this study.

## Coal Bed Methane

CBM is a product of the transformation of plant material into coal; large volumes of methane are produced as coal matures due to heat of burial. This thermogenic methane-rich gas is adsorbed and stored on internal surfaces within the coal. The pressure of fluids (mostly formation water) in the coal reservoir keeps the methane adsorbed onto the coal and minimizes the formation of fractures in the coal. When meteoric waters encounter the methane-rich coals, bacteria act upon the coals and their entrained fluids to produce more methane (PTTC 2000). This biogenic methane-rich gas is also adsorbed onto the coal surfaces. Thermogenic methane can be differentiated from biogenic methane by the ratios of their stable carbon isotopes, that is, the ratio of $C^{12}$ to $C^{13}$ compared to a standard such as the PeeDee belemnite, a fossil marine mollusk (Coplen 1994). Methane with relative enrichment of $C^{12}$ is indicative of low-temperature, biogenic gas; the heavier $C^{13}$ isotope is enriched in the high-temperature gas. Both forms of methane have been reported in CBM reservoirs (USGS 2000).

Coalbed gas reservoirs, because of their fine-grained nature, are able to hold six or seven times as much gas as conventional sand or carbonate reservoirs (USGS 2000), a factor that has made CBM a desirable resource. Methane produced from coal beds is an unconventional hydrocarbon resource that has undergone rapid nationwide development in the past fifteen years (Nelson 2000). The Powder River Basin is estimated to contain approximately 39 trillion cubic feet [TCF] (Hill et al. 2000)—approximately 10 percent of which is in Montana. The methane is contained in the Tertiary-age Fort Union Formation coal beds. Under initial reservoir conditions, the coal is under virgin hydrostatic pressure, which confines the coal and holds in the methane. Pumping water from the coal reduces hydrostatic pressure in the aquifer. The methane releases from the coal and moves through the natural cleat of the coal toward producing boreholes. As the water is pumped off the coal bed aquifer, pressure in the coal is decreased, the coal fractures into a series of fine fractures known as cleat, and the methane is able to move through the fractures and any horizontal bedding planes toward producing boreholes.

CBM in Montana is currently produced only at the CX Ranch field in Big Horn County on the western edge of the Powder River Basin. During the first year of production, 1999, the field produced 204,433 MCF of natural gas. The subsequent year, 2000, the field produced 3.49 billion cubic feet (BCF) of natural gas (MBOGC 2001b).

CBM is prospective in the other RMP areas that are the subject of this EIS. In the Billings RMP area, the Bull Mountains Basin contains Fort Union Formation coals that may be similar to the Powder River Basin coals. The Big Horn Basin, Red Lodge area, and Crazy Mountains Basin also contain Fort Union Formation coals. Gallatin, Park, and Carbon counties contain unknown quantities of Cretaceous coals that may contain CBM. Blaine County contains Cretaceous coals associated with the Eagle Formation. These coals could also produce significant amounts of CBM.

CBM resources are subject to the same drainage issues as conventional oil and gas resources. It is assumed that a single CBM well will drain those resources in a single coal seam across 80 acres. Site-specific CBM drainage may, however, be different and needs to be monitored to protect federal and Indian lands.

## Additional Counties

Park and Gallatin Counties do not produce oil or gas at the present time. Thick Tertiary sediments are present in the Crazy Mountains Basin, which is on strike with the Big Horn and Red Lodge Basins. These sediments may be prospective in the future as oil and gas activity progresses.

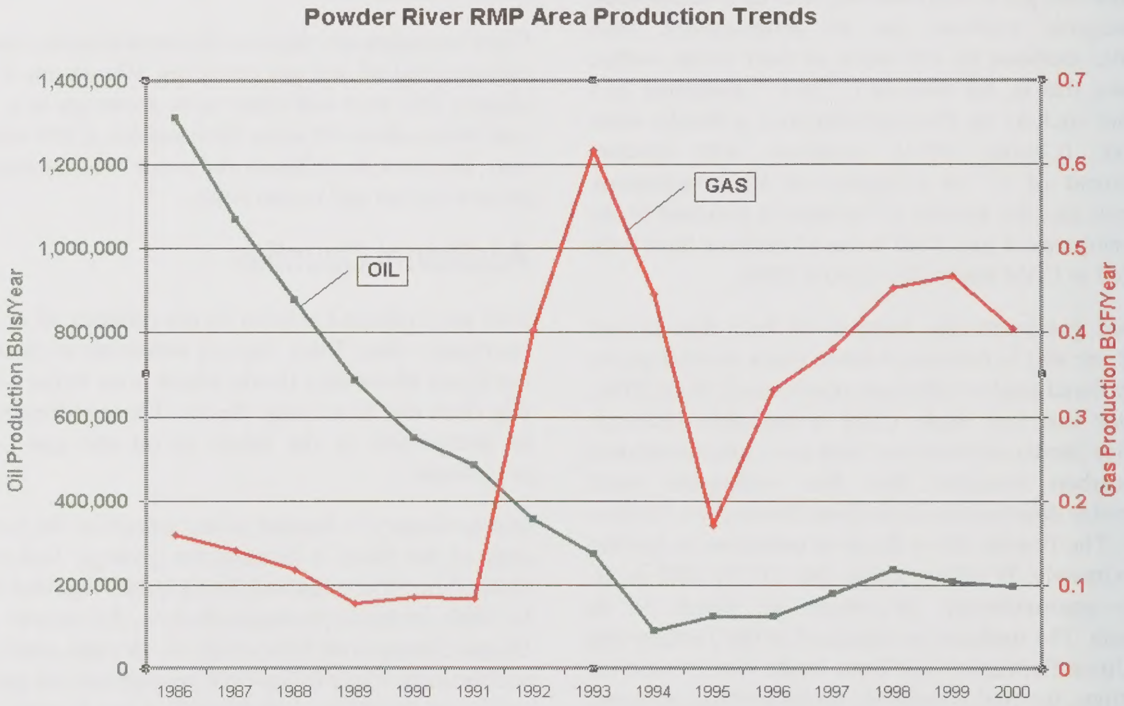
Blaine County is located in the center of the northern edge of the State; it includes the geologic features the Bears Paw Mountains and the adjacent Hogeland Basin. In 2000, 26 fields produced shallow, dry natural gas in Blaine County with little crude oil. Several small fields and the large Tiger Ridge field produce natural gas from the Eagle, Niobrara, and Second White Specks, all of which are shallow formations of the Late Cretaceous. Continued exploration and production drilling is expected to further increase production levels. Production statistics, summarized in Figure GMA-4 (ALL 2001b), show a doubling of natural gas production in the past 15 years. Blaine County produced more than 21 percent of Montana's total gas for 1999 and it shows increases since then. Oil production has varied within narrow limits at relatively low levels.

## Conventional Oil and Gas Production Trends

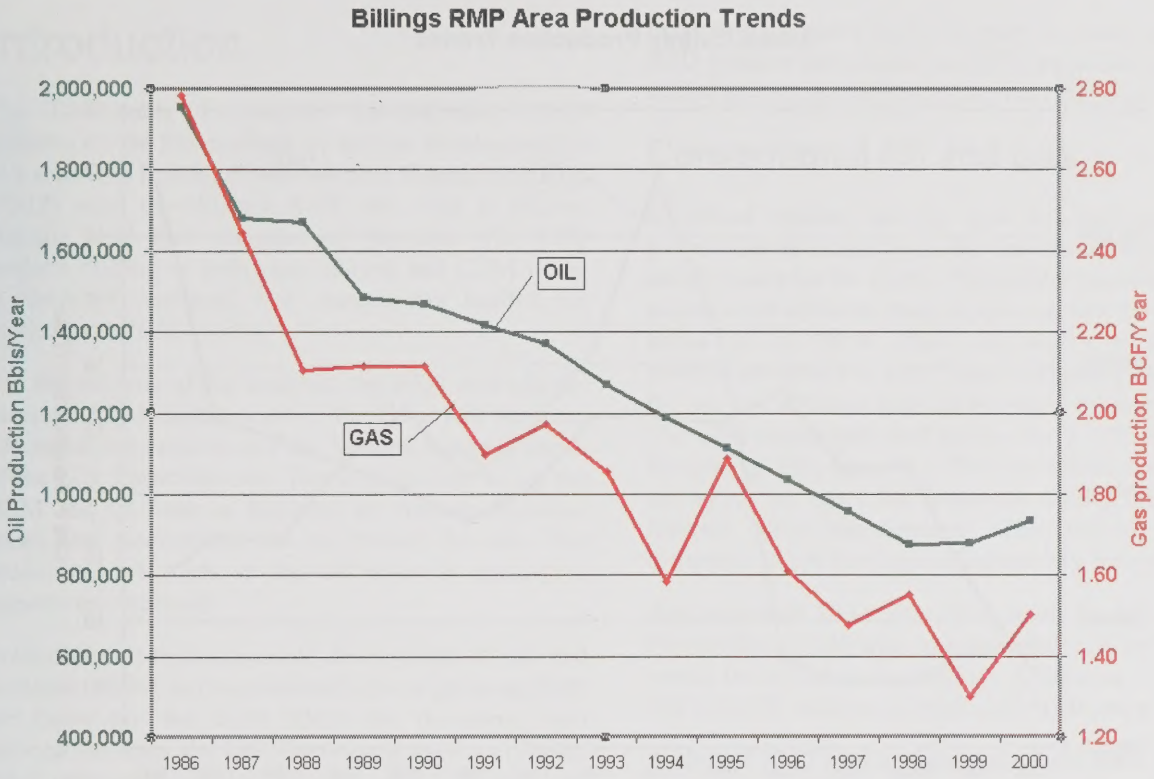
Montana's oil production for 1999 was down by approximately 8 percent (from 16.61 million barrels of oil [mmbo] to 15.27 mmbo) from 1998. The oil production trend has been in place since 1984 when oil production began to decrease because of commodity prices. However, natural gas production increased by approximately 3 percent (59.7 BCF to 61.6 BCF) during 1998. Natural gas production, because of recent discoveries, has not shown the decline of oil production, but instead has shown gradual increases in yearly production (MBOGC 2000). Drilling within the state for conventional oil and gas increased by approximately 55 percent from 1998 to 1999. Geophysical activity continued in 1999 with four seismic contractors permitted for 20 projects—a significant number of which involved 3-D shooting (MBOGC 2000). Horizontal well completions continue to be popular in the state. In 1999, the Montana Board of Oil and Gas Conservation (MBOGC) approval was given for seven new horizontal wells and two horizontal re-completions of existing vertical wells. In 1999, BLM approved four new horizontal wells and one horizontal recompletion. In 2000, BLM approved 13 new horizontal wells and 16 recompletions.

Figures MIN-1 through MIN-3 were constructed using the latest data available from the production files of the MBOGC. The only area of interest that shows production increases is Blaine County, which is one of the state's most important natural gas regions.

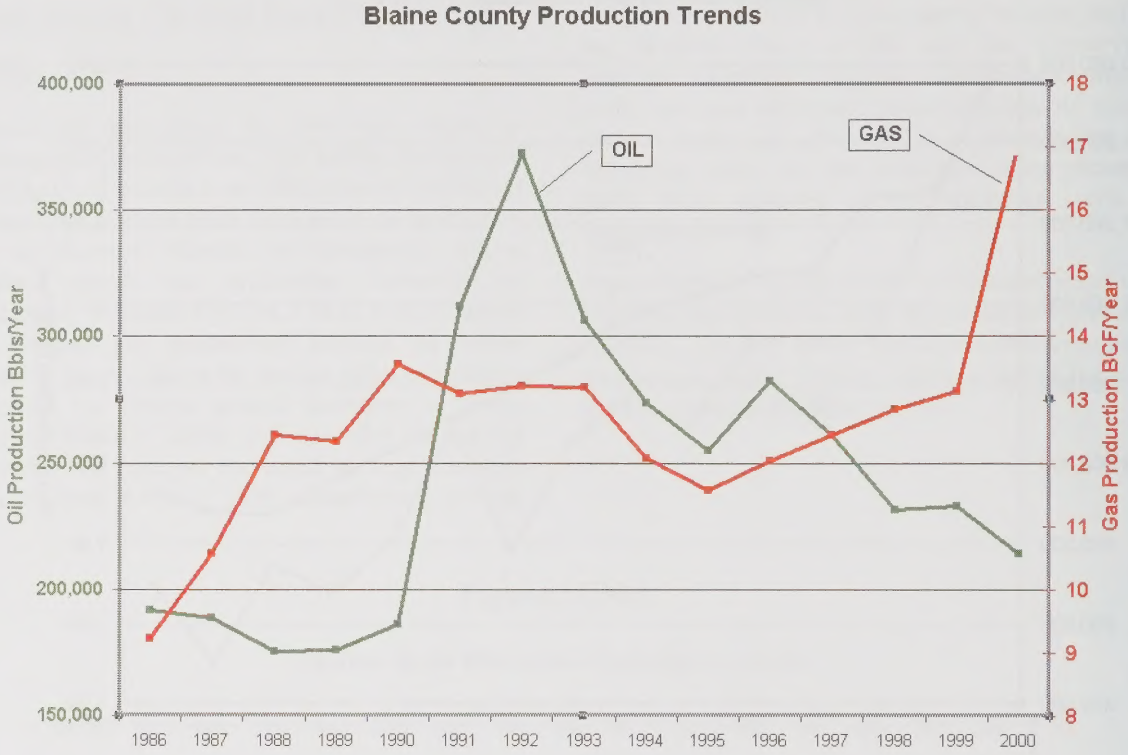
**Figure MIN-1**



## Figure MIN-2


Billings RMP Area Production Trends
Oil Production Bbls/Year
Gas production BCF/Year
OIL
GAS
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

# Figure MIN-3


Blaine County Production Trends
OIL
GAS
Oil Production Bbls/Year
400,000
350,000
300,000
250,000
200,000
150,000
Gas Production BCF/Year
18
17
16
15
14
13
12
11
10
9
8
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000

# REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

## Introduction

The Reasonably Foreseeable Development (RFD) scenario for the EIS predicts oil and gas development in five areas: the Powder River Resource Management Plan (RMP) area, the Billings RMP area, and in Blaine, Gallatin, and Park counties of Montana. The RFD projects drilling of both conventional and CBM wells, numbers of pipelines, and compressors needed for production of CBM wells.

For the purpose of the analysis, the RFD will address potential CBM development of the Crow and Northern Cheyenne reservations and the Ashland Ranger District of the U.S. Forest Service. This is in no way to say the BLM and the State of Montana are making decisions about the reservations or the Forest Service. The predictions are made so that all potential cumulative impacts are analyzed.

Predictions for exploration and development of coal bed methane (CBM) and conventional oil and gas in the RFD are based on: the BLM RMPs for the areas; coal information from the U.S. Geological Survey (USGS); other referenced sources; expressions of interest; and projections from the oil and gas industry (Oct 18, 2000, CBM Coordination meeting).

## Coal Bed Methane

To project CBM exploration and development, the areal extent of certain coals and the rank of coals in the study areas were considered. Areas of sub-bituminous to bituminous were considered as the most likely to be explored and developed in Montana, although exploration and development has occurred mainly in sub-bituminous coal in the Wyoming portion of the Powder River Basin (Basin). The USGS produced a map showing the areas of coal, by rank, for the United States (see Map MIN-1). This information indicates sub-bituminous and bituminous coals in many parts of the study area. Powder River, Rosebud, Custer, and Big Horn counties contain the northern part of the Basin, which extends north from Wyoming. Blaine and Musselshell counties have mostly sub-bituminous coal. Carbon County has an extension of the Big Horn Basin coal, which is ranked as bituminous coal. Gallatin and Park counties have scattered areas of bituminous to sub-bituminous coals. The projection of methane gas estimated to be produced from coal beds in Montana range from a low of 1 TCF (Crockett 2001-PRB est -RMG, Casper) to a high of 17.7 TCF (estimated based on figures from Nelson 2000). This and other information for Montana is used to predict where CBM exploration is most likely to occur in study area. The RFD predicts the number of CBM wells that would be drilled and completed during the next 20 years.

## Conventional Oil and Gas

Historical drilling activity and oil and gas price projections were used to project conventional oil and gas development for the RMPs. The RFD scenario describes a somewhat different level of activity than the scenario found in the BLM *Final Oil and Gas RMP/EIS Amendment* issued in 1992. This is primarily because of the use of a different span for historical drilling activity. The 1992 amendment used the span from 1973 to 1988 in forecasting future activity. This document uses a total period of 80 years for historical drilling activity to forecast future development. This led to a slight difference in the level of drilling activity forecast.

Approximately 200 to 800 wells would be drilled in the Powder River RMP area. Approximately 250 to 975 wells would be drilled in the Billings RMP area. A total of 450 to 1,775 wells could be drilled in 20 years.

A total of 37,233 oil and gas wells have been drilled to date in Montana (Petroleum Information Corp, 2001). In the study area (two RMP areas and three counties) 9,510 wells have been drilled. This is an average of approximately 450 wells drilled per year statewide. From 1995 through 1999 the conventional wells drilled in the state ranged from 209 to 482 (MBOGC Report 1999).

## Coal Areas of Montana

The USGS produced a map showing the areas of coal in Montana. The RMPs also include maps that indicate areas of coal occurrence. The coal volume for each county was used to determine the number of potential CBM wells that could be drilled. The values for volumes of coal in each county came from the BLM RMPs for the area, study papers, or estimates based on coal thickness, and acres of identified coal fields in the county. The coal volumes are based upon all coal beds, not just ones that are likely to be developed because of their thickness, depth, and extent. In some cases the volumes are estimates rather than exact figures. The coal volume in tons was multiplied by a range of estimates of recoverable methane per ton (USGS Professional Report 1625A, 1998 and Flores, et al. 2001) and then divided by an estimate of the gas production per well from CMS Energy's, October 18, 2000, presentation in Miles City (CMS 2000). The amount of gas to be produced per well (0.3 BCF per well) would be used as the lowest economic limit. This resulted in a range of wells that may be drilled over the next 20 years. The coal volume data came mostly from the Powder River and the Billings RMPs, supplemented by information from USGS and Gas Technology Institute (GTI) papers (Nelson 2000).

Coal resources in the Powder River Basin are in the Paleocene Fort Union Formation. About half of the estimated 39 trillion cubic feet of in-place CBM resource is recoverable. Less than half the coal resources occur in the Montana portion of the Basin. These sub-bituminous coals have low concentrations of gas per unit volume (Choate et al. 1984). However, because of the immense total coal thickness that reaches 170 feet in some areas in Montana (Campen 1990), vast quantities of CBM may be present.

Two formations in the Big Horn Basin contain coal. The Red Lodge-Bearcreek deposit is in the Paleocene Fort Union Formation. The coals are classed as sub-bituminous. Nine coal beds have an average total thickness of approximately 45 feet (Darrow, 1954). The Bridger Coal Field is in the upper Cretaceous Eagle Formation. The coal is bituminous in rank. Three coal beds totaling 6 feet are known in this deposit (Campen 1990). The extent of the coals is not known, although the coal may be a source of methane for certain Cretaceous sands (Judith River, Eagle) in the Dry Creek field, which is 5 to 10 miles southwest of Bridger, Montana.

## Gas Well Spacing

The MBOGC establishes the spacing of gas wells. Spacing for wildcat wells is 640 acres per well for each producing formation. MBOGC has the authority to change the well spacing to provide for maximum efficiency and recovery of gas reserves. Well spacing is usually changed after MBOGC has reviewed geologic, engineering and economic data provided by lease operators. The MBOGC then establishes the boundaries for a producing gas field. The planning area includes only one CBM field and numerous conventional gas fields. When a field is discovered, the exploration company would appear before MBOGC to request permanent spacing for the production. Based upon current CBM well spacing in Wyoming and Montana, spacing would probably range from one well per 80 acres to one well per 40 acres for CBM production. The spacing in the CX field is four wells per coal bed per 160 acres. Because of the number of coals in the CX field, this could result in as many as 16 wells per 160 acres or potentially 64 wells per 640 acres. The well density has not reached this level at present and because of the faulting, splitting, and joining of the coals and absence of the coals in some sections this is not likely to happen. CBM is produced from three coal seams in the CX field. Each well produces methane from a single coal seam; however, in the future, wells may be designed to produce from multiple coal seams. This would decrease the number of wells required for production in the CX field.

## Oil Well Spacing

The MBOGC also sets the spacing of oil wells. The spacing for an oil well in the state of Montana is based on the depth of the well. For well depth of 0 to 6,000 feet, the statewide spacing is one well per 40 acres; for well depth of 6,001 feet to 11,000 feet, it would be one well per 160 acres; finally, for well depth of more than 11,001 feet, it would be one well per 320 acres. MBOGC has the authority to change the well spacing to provide for maximum efficiency and recovery of gas reserves. Well spacing is usually changed after MBOGC has reviewed geologic, engineering, and economic data provided by lease operators. The MBOGC then establishes the boundaries for the producing oil field. There are numerous fields within the planning area.

## Areas of Disturbance

### CBM

Surface disturbance for a typical CBM well includes 0.25 acres for the well pad and 0.75 acres for the access road for a total of 1 acre disturbed for drilling operations. Part of the well pad area is reclaimed for production operations, and the entire area of disturbance is reclaimed when the well is plugged and abandoned.

### Conventional

Surface disturbance for a typical conventional shallow gas well (less than 2,000 feet deep) includes 0.5 acres for the well pad and a 2-mile bladed road for a total of 1 acre disturbed for drilling operations. Part of the well pad area is reclaimed for production operations, and the entire area of disturbance is reclaimed when the well is plugged and abandoned.

Surface disturbance for a typical shallow oil well (less than 5,000 feet deep) includes 2 acres for the well pad and 1.5 acres for a 1-mile bladed road for a total of 3.5 acres disturbed for drilling operations. Surface disturbance for a typical deep oil well (from 5,000 to 12,000 feet deep) includes 4 acres for the well pad and 1.5 acres for a 1-mile bladed road, for a total of 5.5 acres disturbed for drilling operations. Part of the well pad area is reclaimed for production operations, and the entire area of disturbance is reclaimed when the well is plugged and abandoned.

## General Assumptions

- All numbers were rounded to the nearest significant number.
- The number of BLM-administered wells will be based on the BLM-administered oil and gas acreage in the county.
- 80 percent of Big Horn County is in the Billings RMP area.

# Occurrence Potential

The text in this section discusses the oil and gas occurrence potential for each county.

## Big Horn County

### CBM

The southeastern and eastern portion of the county contains approximately 28,700 million tons of sub-bituminous coal (Powder River RMP). The area includes one CBM field (CX Ranch).

### Conventional

The county has nine oil and gas fields , including four oil fields, one conventional gas field at Toluca, and an inactive gas field at Hardin. The oil and gas fields in Big Horn County produce from the Ft. Union, Shannon, Amsden, Madison, and Tensleep formations. Production has occurred from the Frontier formation (Hardin Gas field). A total of 844 wells have been drilled to date, of which 172 have been drilled on the Crow Reservation. One gas sales line runs through the north portion of Big Horn County, but none on the Crow Reservation.

## Blaine County

### CBM

There are areas of sub-bituminous coal throughout much of Blaine County. The estimated coal volume of 40 million tons for the county came from the USGS-MBMG report of 1963. The county does not have any CBM production.

### Conventional

Blaine County has 26 oil and gas fields, with 2,123 (Petroleum Information 2001) wells drilled as of June 2001. There are 14 gas producing fields and five producing oil fields. Production occurs from the Judith River, Eagle, Bowdoin, Phillips, and Piper formations. Pipelines and compressor stations are in place in the existing fields.

## Carbon County

### CBM

Carbon County includes the Silvertip, Bear Creek, Bridger and the Joliet-Fromberg coal fields. The coal ranges from Ft Union to Eagle coal and is of sub-bituminous to bituminous nature. The volume of coal is estimated at approximately 760 million tons. The estimate of the gas content of the coals for sub-bituminous will be the same as the coals in the Powder River basin. The estimate for the bituminous coals for the RFD will be from 200 to 450 standard cubic feet (SCF)/ton.

### Conventional

Carbon County includes 18 identified gas and oil fields. The wells produce from the Frontier, Phosporia-Tensleep, Judith River, Claggett, Eagle, and Greybull formations. A total 735 wells have been drilled to date in this county (Dwights well data).

## Carter County

### CBM

Bituminous or sub-bituminous coals have not been identified in Carter County. The only coal is of lignite rank, which is not considered to have a potential to produce methane in economic quantities.

### Conventional

Carter County includes the Bell Creek, Southeast Bell Creek, and Repeat oil fields, as well as two gas fields near Hammond. They produce from the Muddy and Red River formations. There have been 434 wells drilled to date in this county.

## Custer County

### CBM

The Powder River RMP estimated 1.3 billion tons of sub-bituminous coal is located within Custer County. The coal occurs in the southern and southwestern portion of the county.

### Conventional

The Liscom Creek and Pumpkin Creek fields are located in Custer County. Gas in these fields is produced from the Shannon formation. These fields have a small sales line in place.

## Gallatin County

### CBM

Very little coal is identified in Gallatin county; some has been identified in the eastern edge or southern part of the county. Coal mining has also historically occurred in Gallatin County (Roberts 1966, and Calvert 1912a and 1912b). The volume is estimated to be approximately 50 million tons of sub-bituminous to bituminous coal.

### Conventional

There are no oil or gas fields in Gallatin County, and only 22 conventional wells have been drilled to date.

## Golden Valley County

### CBM

Although there is some coal shown for Golden Valley County, there are no volumes estimated. The coal that is shown is of the sub-bituminous rank.

### Conventional

Two oil and two gas fields have been identified in this county, and 124 wells have been drilled to date. The wells have produced from the Cat Creek, Lakota, Niobrara, Frontier, Heath, and Tyler formations.

## Musselshell County

### CBM

The RMP estimated 646.6 million tons of sub-bituminous coal in the county. These Ft. Union coals are located in the Bull Mountain Basin.

### Conventional

Thirty-five fields have been identified in Musselshell County, and 1,415 wells have been drilled to date. The wells have produced from the Amsden, Cat Creek, Morrison, Heath, and Tyler formations.

## Park County

### CBM

Park County has scattered areas of an estimated 100 million tons of sub-bituminous and bituminous coal. Coal mining has also historically occurred in Park County (Roberts 1966, and Calvert 1912a and 1912b). A gas transmission line runs through the center of the county.

### Conventional

There are no identified oil and gas fields in Park County. There have been 32 wells drilled to date in the county.

## Powder River County

### CBM

Based on information from the RMP, there are 27 billion tons of sub-bituminous coal in the county. The coal is located mostly in the western half of the county.

### Conventional

The county has seven oil and gas fields, including Bell Creek, which is the second-largest producing field in Montana (based on cumulative production). The Shannon and Muddy formations are productive in the county, and 1,249 wells have been drilled to date.

## Rosebud County

### CBM

Rosebud County contains 11.3 billion tons of sub-bituminous coal. The coal is located in the southern and eastern portion of the county.

### Conventional

Rosebud County has 18 identified oil and gas fields producing from the Tyler formation, and 1,147 wells have been drilled to date.

## Stillwater County

### CBM

There is one identified bituminous coal field (Stillwater) in the county and it is estimated to have 475 million tons of Eagle formation coal. The coal is estimated to contain a much higher gas content per ton than the Powder River sub-bituminous coals. The county has three gas transmission lines running through the north half of the county.

### Conventional

The county has 11 identified oil and gas fields. The producing formations are the Frontier, Eagle, Claggett, Cat Creek, Morrison, and Virgelle. There have been 367 conventional wells drilled to date in the county.

## Sweet Grass County

### CBM

There are no known coal reserves in the county. However, there are gas transmission lines through the center and running southeast and northeast in the county.

### Conventional

One identified field—a six-shooter dome—is in Sweet Grass County. This is the Sixshooter Dome. The productive formations in the county are the Eagle and Lakota. There have been 82 conventional wells drilled to date.

## Treasure County

### CBM

The RMP's coal estimates for the county from the RMP are 100 million tons. A gas transmission line runs through the southeastern part of the county.

### Conventional

There are no identified oil and gas fields in the county and no productive formations have been identified; however, 32 conventional wells have been drilled to date.

## Wheatland County

### CBM

No coal has been identified in Wheatland County. A gas transmission line runs through the eastern part of the county.

### Conventional

One oil and gas field—Mud Creek—has been identified in the county. The Amsden formation is productive, and 60 conventional wells have been drilled to date in the county.

## Yellowstone County

### CBM

Some 590 million tons of coal have been identified in the county. There are four gas transmission lines in the southern part of the county.

### Conventional

Six oil and gas fields are identified in the county, and 425 conventional wells have been drilled to date. The productive formations that have been identified are the Mosser Sand, Amsden, and Dakota.

# Reasonably Foreseeable Future Actions

Reasonably Foreseeable Future Actions (RFFA) address the potential developments that may occur within other jurisdictions that fall within the Billings and Powder River resource management areas. The same general assumptions and source data used for developing the RFD are applicable.

## Crow Reservation

### CBM

There has been 16.1 billion tons of coal identified on the Crow Reservation.

### Conventional

The reservation includes the Soap Creek, Lodge Grass, Gray Blanket, and Ash Creek oil and gas fields. There have been 172 conventional wells drilled to date on the reservation. Production occurs from the Shannon, Tensleep, Amsden and Madison formations within the reservation.

## Northern Cheyenne Reservation

### CBM

Based upon limited data, it is estimated that 16.3 billion tons of sub-bituminous coal lie within the reservation. The coal is believed to underlie most or all of the reservation.

### Conventional

The reservation does not have any known oil or gas fields. Twenty conventional wells have been drilled to date.

## Ashland District, U.S. Forest Service

### CBM

Tertiary Ft. Union coal is believed to underlie most or all of the Ashland Forest.

# REASONABLY FORESEEABLE DEVELOPMENT—ALTERNATIVE A

## CBM

A general assumption used for this alternative for CBM wells is that the number of townships of potential development in each county would be limited to areas where coal has been identified. Additionally, other assumptions were used for Alternative A for CBM wells. These include:

- CBM drilling would only be allowed where there was a need for additional data (townships where no CBM wells had been drilled by any company).
- CBM drilling would occur but there would be no production (from federal wells). That is, the permits would be for drilling and production testing but no commercial production (with associated infrastructure).
- No permanent pipelines, power-lines, or any production facilities would be installed at any of the federal CBM wells.
- There would be no discharge of produced water allowed from any of the federal CBM wells.
- For a high number, four wells per township were assumed; for the low number, one well per township was assumed.
- It was assumed that the number of townships in each county would be limited to areas where coal has been identified.

### BLM-Administered

An estimated 400 acres based on 400 CBM wells would be disturbed during exploratory drilling operations (0.25 acre per location and 0.75 acre per access road) which is the number of wells predicted to be drilled during the 20-year analysis period. The total number of acres could be reduced if more than one methane well is drilled on the well pad—as is the pattern in the CX Field.

### State-Administered

#### Existing Management Assumptions

There will be 325 CBM wells permitted for the Redstone project area in Big Horn County. Of these, only 250 will be allowed to produce and 75 will be for exploration only. Two hundred CBM exploration wells will be permitted for the rest of the state.

## Conventional Oil and Gas

The RFD scenario from the *Oil and Gas Amendment* contains projections for the number of wells and acres disturbed in each producing region. The disturbance for each well is based on the typical depth of wells for an area. Shallow wells generally disturb fewer acres. Tables 4.1 through 4.4 in the *Oil and Gas Amendment* (pages 55 and 56) show totals for the planning area and each resource area. The assumptions for conventional oil and gas in this alternative are as follows:

- The unconstrained number of wells comes from the Oil and Gas Amendment RFD scenario.
- The constrained number of wells is derived from the resource analysis for wells foregone in No Surface Occupancy areas.
- The average acreage figure (total acres/total wells) for the resource area was used to estimate federal acres disturbed.
- The RFD projections have a 20-year life.
- A more detailed description of information for the assumptions is contained in the *Oil and Gas Amendment* in *Chapter 4, Social Economic Conditions* (BLM 1992), and in *Appendix C.*

### BLM-Administered

The number of acres disturbed during drilling operations would be 1,342 acres based on 400 wells, which is the number of wells predicted to be drilled during the 20-year analysis period.

### State of Montana

The number of acres disturbed during drilling operations would be 4,551 acres based on 891 new wells predicted for the 20-year analysis period in the Powder River and Billings RMP areas. The conventional wells in Blaine, Park, and Gallatin counties will be based on historical drilling for those counties. The RFD for the State of Montana for conventional wells under this alternative is the same as Alternatives B, C, D, and E.

# Development Potential

The development potential for federal oil and gas in each county is described in the text that follows.

## Big Horn County

### CBM

Based on the review of unexplored coal areas in Big Horn County, there would be 20 to 64 exploration wells drilled on minerals under BLM jurisdiction. Approximately 16 to 44 of these wells would have production potential and 4 to 20 wells would be drilled and abandoned. The only disturbance would be for the access road and well pad.

### Conventional

The county has potential for five to 30 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Carbon County

### CBM

Based on the unexplored coal areas in the county, the BLM could permit the drilling of approximately 24 to 72 wells under this alternative. Sixteen to 48 of these wells would have the potential to be productive, and 8 to 24 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

### Conventional

Carbon County has potential for 10 to 45 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Carter County

### CBM

No CBM wells are projected to be drilled under this alternative in the county.

### Conventional

The county has potential for 1 to 6 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Custer County

### CBM

Based on the unexplored coal areas in the county, the BLM could permit the drilling of from 20 to 64 wells under this alternative. Sixteen to 44 of these wells would have the potential to be productive, and four to 20 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

### Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Gallatin County

### CBM

No CBM wells are projected to be drilled in this county on minerals under BLM jurisdiction with this alternative.

## Golden Valley County

### CBM

No CBM wells are projected to be drilled in this county on minerals under BLM jurisdiction with this alternative.

### Conventional

The county has potential for one to six additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Musselshell County

### CBM

Based on the unexplored coal areas in the county, the BLM could permit the drilling of 10 to 40 wells under this alternative. From eight to 30 of these wells would have the potential to be productive, and two to 10 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

### Conventional

The county has potential for 20 to 90 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Park County

### CBM

There are no CBM wells projected to be drilled in this county on minerals under BLM jurisdiction with this alternative.

## Powder River County

### CBM

Based on the unexplored coal areas in the county, the BLM could permit the drilling of from 20 to 80 wells under this alternative. Sixteen to 60 of these wells would have the potential to be productive, and four to 20 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

### Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Rosebud County

### CBM

Based on the unexplored coal areas in the county, the BLM could permit the drilling of 12 to 48 wells under this alternative. Eight to 32 of these wells would have the potential to be productive, and four to 16 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

### Conventional

The county has potential for 10 to 40 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Stillwater County

### CBM

Based on the unexplored coal areas in the county, the BLM could permit the drilling of six to 24 wells under this alternative. Four to 18 of these wells would have the potential to be productive, and two to six wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

### Conventional

The county has potential for three to 12 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Sweet Grass County

### CBM

Based on the lack of known coal reserves in the county, no CBM wells are expected under this alternative.

### Conventional

The county has potential for one to six additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Treasure County

### CBM

Based on the unexplored coal areas in Treasure County, the BLM could permit the drilling of two to four wells under this alternative. Up to two of these wells would have the potential to be productive, and up to two wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

### Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Wheatland County

### CBM

There are no CBM wells projected to be drilled on minerals under BLM jurisdiction in the county.

### Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

## Yellowstone County

### CBM

Based on the unexplored coal areas in the county, the BLM could permit the drilling of two to six wells under this alternative. Up to three of these wells would have the potential to be productive, and up to three wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

### Conventional

The county has potential for five to 15 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

# RFD Conclusion

## CBM

During the life of the plan, it is estimated that the number of CBM exploration wells that may be drilled throughout the two RMP areas would range from a low of 120 wells to a high of 400 wells on BLM-administered minerals. CBM drilling would be allowed but there would be no production (from federal wells). This means the permits would be for drilling and testing but no production. There would be no pipelines or power-lines or any production facilities installed at any of the federal CBM wells. There would be no discharge of produced water allowed from any of the federal CBM wells. This would result in approximately 400 acres of disturbance for the 400 wells (0.25 acre/location and 0.75 acre/access road).

State development under this scenario would include previously approved CBM wells at the CX Ranch and additional exploration wells. The CX Ranch could drill up to 325 wells, of which 250 could be developed for production. An additional 200 exploration well permits would be issued to operators to investigate the likelihood of CBM development throughout the state.

### Powder River RMP Area

During the life of the plan, it is estimated that the number of CBM wells that may be drilled in the Powder River RMP area would range from a low of 60 wells to a high of 240 wells on BLM-administered minerals. CBM drilling would be allowed but there would be no production (from federal wells). This means the permits would be for drilling and testing but no production. There would be no pipelines or power-lines or any production facilities installed at any of the federal CBM wells. There would be no discharge of produced water allowed from any of the federal CBM wells. This would result in approximately 240 acres of disturbance for the 240 wells (0.25 acre/location and 0.75 acre/access road).

### Billings RMP Area

During the life of the plan, it is estimated that the number of CBM wells that may be drilled throughout the Billings RMP area would range from a low of 50 wells to a high of 160 wells on BLM-administered minerals. CBM drilling would be allowed but there would be no production from Federal wells. This means the permits would be for drilling and testing but no production. There would be no pipelines, power-lines, or any production facilities installed at any of the federal CBM wells. There would be no discharge of produced water allowed from any of the federal CBM wells. This would result in approximately 160 acres of disturbance for the 160 wells (0.25 acre/location and 0.75 acre/access road).

## Conventional Oil and Gas

Based on the Assumptions listed at the beginning of this section, the number of conventional oil and gas wells that could be drilled on BLM administered minerals would range from a low of 60 to a high of 260 wells. No estimates of disturbance were made for conventional wells.

### Powder River RMP Area

The RFD estimates that 15 to 60 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

### Billings RMP Area

The RFD estimates that 45 to 200 conventional wells are to be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

# Reasonably Foreseeable Future Actions—Alternative A

The RFFA predictions for Alternative A were developed using the same general assumptions as the RFD.

## Forest Service—Administered

Currently, the Custer National Forest, Ashland Ranger District, is not open for oil and gas leasing. Alternative A assumes that similar management would continue, no leases would be issued, and no wells drilled.

## Crow Reservation

### CBM

Although there is a considerable amount of known coal reserves on the reservation, it is assumed that the Crow Tribe of Indians would not develop any CBM under this alternative.

### Conventional

The Reservation has potential for ten to twenty additional wells to be drilled on Tribal minerals in the next 20 years, based on historical drilling rates.

## Northern Cheyenne Reservation

### CBM

Although there is a considerable amount of known coal reserves on the reservation, it is assumed that the Northern Cheyenne Tribe would not develop any CBM under this alternative.

### Conventional

Based on historical drilling rates it would appear that no conventional oil or gas wells would be developed on the reservation under this alternative.

# REASONABLY FORESEEABLE DEVELOPMENT—Alternatives B, C, D, and E

## Assumptions

### CBM

The following assumptions were used to calculate the number of wells to be drilled, the number of in-field compressors, and the number of sales compressors required:

- The coal volume for each county was taken from published sources such as the RMPs. For the RMPs, all tonnages are based on in-place coal with development potential defined as beds 5 feet thick or greater, with a 15:l or less stripping ratio, and 500 feet of overburden or less. This gives a greater tonnage than actual limits currently used by the mining industry in the area, where stripping limits seldom exceed 200 feet of overburden or a ratio of 6:l. Tonnage calculations are based on 1,770 tons/acre-foot. For the Northern Cheyenne Reservation, the coal volumes from the USGS and U.S. Bureau of Mines reports is based on very limited data. The coal volumes for the Crow Reservation from the USGS and U.S. Bureau of Mines report were based on more extensive data. The coal tonnages in the RMPs include strippable coal, which may or may not contain producible methane in economic quantities

- The gas content per ton used to calculate the quantity of gas from sub-bituminous coal was 74 standard cubic feet per ton (SCF/ton) and came from studies by the USGS (Professional Paper 1625-A). The gas content for bituminous coal used to calculate the quantity was (450 SCF/ton) and came from a paper by Campen and Gruber (1991).

- The spacing for the CBM wells would be one well per 80 acres per coal seam. The spacing was assumed after discussions with the MBOGC, as well as our understanding that Wyoming will be using this spacing (as a general rule) for CBM wells.

- Three coal seams would be developed per 80 acres. Another way of saying this is there would be three wells per pad in each 80 acres.

- One field compressor would service 24 CBM wells. The area of disturbance would be 0.5 acres.

- One sales compressor could handle 10 field compressors. The area of disturbance would be 0.5 acres.

- Each CBM well would produce .3 BCF of gas.

- Where the wells would be located in the counties was based on either the Montana Coal Occurrences from the USGS open file report OF 96-92, the RMPs, or information from the U.S. Bureau of Indian Affairs (BIA).

- No predictions were made based on distances to coal outcrops, thickness of individual coal seams, or thickness of overburden to coals. This information will be used by companies to place individual wells.

- The coal in each county did not include the coal on the Indian reservation in that specific county. The coal (from USGS and U.S. Bureau of Mines reports) on each Indian reservation resulted in a number of wells being drilled on each reservation.

- The RFD assumed that areas of lignite would not have economic production of methane so no wells were forecasted in those areas. We are not aware of any companies or individuals that are currently pursuing the testing of lignite for gas. With the present technology, it is unlikely that industry will be able to produce commercial amounts of gas from lignite within Montana, for the reasonably foreseeable future.

- The number of CBM producing wells in each county would be approximately 90 percent of the total CBM wells projected for that county.

- The number of CBM dry holes would be approximately 10 percent of the total CBM wells projected for that county.

- A 0.5-mile gathering line would be buried from the CBM well to the field compressor. The width of disturbance would be 15 feet. Multiple flowlines would be laid in the same trench from a well pad with more than one CBM well. Whenever possible, these lines would be placed in the access road to the wells. This would result in 0.9 acres of disturbance per line.

- There would then be steel lines going from each gathering field compressor to the sales compressor. There would be 2 miles of these steel lines per field compressor. The width of disturbance would be 25 feet. This would result in 6 acres of disturbance per line.

- The lines would go from the sales compressor to the sales lines. These would be high-pressure steel lines. There would be no more than 60 miles of these high-pressure steel lines per county. The width of disturbance would be 25 feet. This would result in 3 acres of disturbance per mile of sales line.
- The estimates for CBM wells did not take into account variations in topography, which could have a significant impact to actual placement and numbers of wells.
- The rate of development for 20 years was based on the industry projection of October 18, 2000. The projected rate is shown in Figure MIN-4. The rate of abandonment is presented in Figure MIN-5.
- For purposes of planning, the State of Montana would consider other counties, such as Blaine, Gallatin, or Park, which may have coal resources.

## Conventional Wells

- Wells drilled to date in each county were taken from Dwights well data.
- The number of wells drilled to date was divided by 80 years, which is an approximation of how long exploration has been ongoing.
    - This number was multiplied by one quarter (.25), then multiplied by 20 years for the low estimate of drilling for the next 20 years.
    - The number was multiplied by 20 years to calculate a high level of drilling for the next 20 years.
- The wells drilled on each reservation were counted in the total for each county.
- The percentage of dry holes for each county is based on the overall historical percentage of non-producing wells (71 percent), compared to the total wells drilled per county.
- The acres disturbed per well will be the same as shown in alternative A.

# Development Potential

The development potential for CBM and conventional wells for all owners is described in the text that follows.

## Big Horn County

### CBM

Based on the volume of coal in these areas, Big Horn County could support from 2,500 to 7,000 CBM wells. Approximately, half of these wells (1,250 to 3,500) would be drilled on minerals under BLM jurisdiction. Producing CBM wells would range from 2,200 to 6,300 wells. Most of the wells in Big Horn County would be in the southeastern portion of the county. There would be from 100 to 250 field compressors. The number of sales compressors estimated for Big Horn County would be from 10 to 25. This level of production would require gathering and sales lines to be constructed. From 1,450 to 4,200 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. From 200 to 500 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines. The sales lines would probably go north toward the main WBI pipeline or south to main lines in Wyoming.

### Conventional

The county has potential for 50 to 200 additional wells to be drilled in the next 20 years, based on historical drilling rates. From 3 to 15 of these wells would be drilled on minerals under BLM jurisdiction.

## Blaine County

### CBM

An area of identified coal exists near Chinook where it is estimated that five to 10 CBM wells could be drilled, and of these, five to 10 wells would be producing. This would result in one field compressor and up to one sales compressor. Three to 7 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells, and would follow the roads to the field compressors. One to 2 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 20 miles of sales lines would be laid to the main transmission lines.

### Conventional

During the past 5 years, 134 conventional wells were drilled in the county. The county produces a significant portion of the non-associated gas produced in Montana, therefore the gas infrastructure is present. The RFD estimates from 150 to 500 conventional wells to be drilled in the next 20 years. Forty to 120 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in the existing fields.

## Carbon County

### CBM

The coal in Carbon County varies from Tertiary Ft. Union (sub-bituminous) to the Cretaceous Eagle (bituminous). The Eagle coal can contain more gas per ton than the Ft. Union coals. Based on the coal volumes and gas content, 150 to 400 wells could be drilled. Thirty to 60 of these wells would be drilled on minerals under BLM jurisdiction. From 135 to 360 producing CBM wells mostly would be located near the identified coal fields. The number of wells would require from five to 15 field compressors and one to two sales compressors. Ninety to 240 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Ten to 30 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There would be no more than 60 miles of sales lines laid to the main transmission lines.

### Conventional

Based on historical drilling, it is estimated that 50 to 200 wells would be drilled in the next 20 years. From 10 to 40 of these wells would be drilled on minerals under BLM jurisdiction. Some of these would be wildcat wells, but the majority would probably be associated with the existing fields.

## Carter County

### CBM

CBM wells are not predicted to be drilled in Carter County because of the nonexistence of bituminous or sub-bituminous coals.

### Conventional

Based on historical drilling rates, we anticipate 25 to 100 wells to be drilled in the next 20 years. Ten to 40 of these wells would be drilled on minerals under BLM jurisdiction.

## Custer County

### CBM

Based on the estimated quantity of coal, 100 to 300 wells will need to be drilled; of these, 90 to 270 would be producing wells. The CBM development would occur in the southwestern corner of the county. Twenty to 70 of these wells would be drilled on minerals under BLM jurisdiction. This many wells would require from five to 10 field compressors and one to two sales compressors. Additional pipelines would have to be built. Sixty to 180 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Ten to 20 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines.

### Conventional

Based on historical drilling rates, we estimate from 15 to 60 wells will be drilled in the next 20 years. Five to 15 of these wells would need to be drilled on minerals under BLM jurisdiction.

## Gallatin County

### CBM

Based on the estimates of coal volume, five to 15 wells will be drilled; of these, five to 10 would be producing wells. This would require one in-field compressor and may require one sales compressor depending on where the wells are located in the county. There is one gas sales line going through the north part of the county. Three to 7 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Additionally, 1 to 2 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 20 miles of sales lines would be laid to the main transmission lines.

### Conventional

Based on historical drilling activity, it is anticipated that one to five wells would need to be drilled in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

## Golden Valley County

### CBM

No CBM wells are anticipated to be drilled in Golden Valley County.

### Conventional

Based on historical drilling activity, it is anticipated that 10 to 30 wells would be drilled in the county over the next 20 years. Most of these will probably be near the existing fields. One or two of these wells would be drilled on minerals under BLM jurisdiction.

## Musselshell County

### CBM

Based on the estimates of coal in the county, it is projected that 60 to 150 wells would be drilled, and of these, there would be from 50 to 140 producing wells. Five to 20 of these wells would be drilled on minerals under BLM jurisdiction. These wells would require from two to five in-field compressors and one sales compressor. No gas sales lines run through the county. Thirty to 100 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Five to 10 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines.

### Conventional

It is estimated that 100 to 350 wells will be drilled in the county in the next 20 years. Ten to 40 of these wells would be drilled on minerals under BLM jurisdiction.

## Park County

### CBM

It is estimated that 10 to 25 CBM wells would be drilled in Park County, and of these, there would be 10 to 20 producing wells. These would require one field compressors and no sales compressor. There also would be from 7 to 17 miles of plastic, low-pressure gathering lines needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressor. One to 2 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There is a compressor station currently located in the county, so it is assumed that the gas would be compressed to sales pressure.

### Conventional

Based on historical activity, an estimated one to 10 wells will be drilled in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction

## Powder River County

### CBM

Based on the coals present in Powder River County, it is estimated that 2,300 to 6,700 CBM wells could be drilled. From 1,150 to 3,350 of these wells would be drilled on minerals under BLM jurisdiction. There would be 2,070 to 6,030 producing CBM wells, which would require 100 to 250 field compressors, and 10 to 25 sales compressors. There is a transmission line in the southeastern part of the county but more pipelines would have to be built to gather and transport the potential gas that could be produced from this many wells. From 1,380 to 4,000 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Two hundred to 500 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There would be no more than 60 miles of sales lines laid to the main transmission lines.

### Conventional

Based on historical drilling rates, it is anticipated that 80 to 300 conventional wells would need to be drilled in the county over the next 20 years. Thirty to 100 of these wells would be drilled on minerals under BLM jurisdiction.

## Rosebud County

### CBM

Based on the coal estimates for Rosebud County, the RFD projects 1,000 to 2,800 CBM wells will be drilled. From 500 to 1,400 of these wells would be drilled on minerals under BLM jurisdiction. There would be from 900 to 2,500 producing CBM wells, which would require approximately 40 to 100 field compressors and from five to 10 sales compressors. From 600 to 1650 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Eighty to 200 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors, and there would be no more than 60 miles of sales lines laid to the main transmission lines. There is one gas sales line that runs through the county south of Forsyth. The CBM development would occur in the southern and eastern half of the county.

### Conventional

Based on historical drilling rates in the county, the RFD projects 50 to 300 wells to be drilled over the next 20 years. Five to 50 of these wells would be drilled on minerals under BLM jurisdiction.

## Stillwater County

### CBM

The RFD projects 300 to 700 CBM wells to be drilled in the county. Fifteen to 35 of these wells would be drilled on minerals under BLM jurisdiction. These would most likely be drilled in the vicinity of the existing coal field. From 270 to 630 would be producing CBM wells. This would require 10 to 25 field compressors and one to three sales compressors. One hundred and eighty to 420 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Twenty to 50 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 30 miles of sales lines would be laid to the main transmission lines.

### Conventional

Based on historical drilling rates, the RFD projects 25 to 100 conventional wells will be drilled in the next 20 years. Two to 5 of these wells would be drilled on minerals under BLM jurisdiction.

## Sweet Grass County

### CBM

There are no known coal reserves in the county and therefore, no CBM wells are anticipated for Sweet Grass County.

### Conventional

Based on historical drilling rates, the RFD projects that five to 20 conventional wells will be drilled in the next 20 years. Up to 1 of these wells would be drilled on minerals under BLM jurisdiction.

## Treasure County

### CBM

Based on the estimated coal volume in this county, the RFD projects that 10 to 25 CBM wells could be drilled. One to 2 of these wells would be drilled on minerals under BLM jurisdiction. There would be eight to 22 producing CBM wells, which would require 1 to 2 in-field compressors and 1 sales compressor. Five to 15 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. One to 2 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 10 miles of sales lines would be laid to the main transmission lines.

### Conventional

Based on historical drilling rates, the RFD projects one to 10 conventional wells will be drilled in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

## Wheatland County

### CBM

No CBM wells are projected to be drilled in Wheatland County.

### Conventional

Based on historical drilling rates, the RFD projects five to 15 conventional wells will be drilled in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

## Yellowstone County

### CBM

Based on the identified coal, there could be from 50 to 150 CBM wells drilled in the next 20 years. One to 10 of these wells would be drilled on minerals under BLM jurisdiction. There would be 40 to 140 producing CBM wells in the county, which would require from two to five field compressors and one sales compressor. Twenty five to 90 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Five to 10 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 10 miles of sales lines would be laid to the main transmission lines.

### Conventional

Based on historical drilling in the county, there could be from 25 to 100 wells drilled in the county in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

# RFD Conclusion

## CBM

During the life of the plan, it is estimated that the number of CBM wells that may be drilled throughout the five study areas would range from a low of 10,000 to a high of 18,300—of which 2,975 to 8,450 would be drilled on BLM-administered minerals. There would be from 8,500 to 16,500 producing CBM wells, of which 2,500 to 7,500 would be BLM administered. For a graphical presentation of these predictions, refer to Map 4-1 in Chapter 4 of this EIS. Table MIN-1 at the end of this section presents the RFD Expanded Development Scenario in numerical form.

These wells would require 250 to 700 field compressors, and 25 to 70 sales compressors. From 3,900 to 11,200 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Five hundred to 1,400 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors, and approximately 480 miles of sales lines would be laid to the main transmission lines. This would result in 22,500 to 74,000 acres of disturbance.

### Powder River RMP Area

During the next 20 years, it is estimated that the number of CBM wells that may be drilled throughout the Powder River RMP area, would range from a low of 5,400 to a high of 15,600. The number of wells drilled each year would range from 200 to 1,100. There also would be 4,800 to 13,400 producing CBM wells, which would require 200 to 550 field compressors and 20 to 55 sales compressors. From 3,200 to 8,900 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From 400 to 1,100 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. Approximately 290 miles of sales lines would be laid to the main transmission lines. This would result in 24,400 to 73,600 acres of disturbance.

### Billings RMP Area

During the next 20 years, it is estimated that the number of CBM wells that may be drilled throughout the Billings RMP area, would range from 100 to 2,600. There would be 100 to 2,350 producing CBM wells, which would require 5 to 100 field compressors and 1 to 10 sales compressors. One hundred to 1,600 miles of plastic, low-pressure gathering lines needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From 10 to 200 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. Approximately 170 miles of sales lines would be laid to the main transmission lines. This would result in 350 to 18,400 acres of disturbance.

### Blaine County

The RFD estimates three to 10 CBM wells could be drilled. This would result in one field compressor and up to 1 sales compressors. There would be from 2 to 7 miles of plastic, low-pressure gathering lines needed, which would be laid in the travel routes to the wells and follow the roads to the field compressors. From 1 to 2 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 20 miles of sales lines would be laid to the main transmission lines. This would result in 75 to 100 acres of disturbance.

### Park County

Ten to 25 CBM wells would be drilled in Park County. These wells would require 1 field compressor and no sales compressor. Seven to 17 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressor. One to 2 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. Presently, there is a compressor station located in the county so it is assumed that the gas would be compressed to sales pressure at the compressor station. This would result in 40 to 100 acres of disturbance.

### Gallatin County

Based on the estimates of coal volume, it is anticipated that five to 15 wells would be drilled. This would require 1 field compressor, and may require 1 sales compressor depending on where the wells are located in the county. There is one gas sales line going through the north part of the county. Three to 10 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From1 to 2 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 20 miles of sales lines would be laid to the main transmission lines. This would result in 80 to 120 acres of disturbance.

## Conventional Oil and Gas

Based on the assumptions listed at the beginning of this section, the number of conventional oil and gas wells that could be drilled would range from 700 to 2,850. The number of wells drilled each year would range from five to 15 in each of the 17 counties if the wells were distributed equally among the counties. No estimates of disturbance were made for conventional wells.

### Powder River RMP Area

The RFD estimates that 300 to 1,300 conventional wells would be drilled in the next 20 years in the Powder River RMP area. Seventy to 300 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

### Billings RMP Area

The RFD estimates that 240 to 925 conventional wells would be drilled in the next 20 years in the Billings RMP area. Twenty-five to 100 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

### Blaine County

The RFD estimates that 150 to 500 conventional wells would be drilled in Blaine County in the next 20 years. From 32 to 127 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in the existing fields.

### Park County

Based on historical activity, it is estimated that two to eight wells will be drilled in Park County in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction

### Gallatin County

Based on historical drilling activity, it is anticipated that from one to six wells would be drilled in Gallatin County in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

# Reasonably Foreseeable Future Actions—Alternatives B, C, D, and E

The RFFA predictions for Alternative B, C, D, and E were developed using the same general assumptions as the RFD. However, the coal tonnages for the Indian reservations is based on the thickest coals (coals over 20 feet thick).

## Development Potential

The development potential for CBM and conventional wells for all owners on the Crow Reservation, Northern Cheyenne Reservation and the Custer National Forest is described in the text that follows.

## Ashland District, U.S. Forest Service

### CBM

Coal resources are primarily concentrated in the southern portion of the district. Otter Creek and the Tongue River drainages have eroded or exposed many of the coal zones. Based on the coal resources, the RFFA predicts that approximately 200 wells may be drilled over 20 years. This would result in approximately 400 acres of long-term disturbance.

## Crow Reservation

### CBM

Based on the identified coal resources within the reservation, 1,400 to 4,000 CBM wells could be drilled; of these, 1,300 to 3,600 would be producing wells. The wells would probably be located in the eastern portion of the Crow Reservation. This would require from 50 to 150 field compressors and from five to 15 sales compressors. Eight hundred to 2,400 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. One hundred to 300 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines. This would result in 7,000 to 12,000 acres of disturbance.

### Conventional

Based on historical drilling rates, 10 to 50 conventional wells could be drilled in the next 20 years.

## Northern Cheyenne Reservation

### CBM

Based on coal resources, 1,400 to 4,000 CBM wells could be drilled on the reservation; of these, there would be 1,300 to 3,600 producing wells. The wells would most likely be located along the southern boarder of the reservation and extend from the western to the eastern boundaries. This would require 50 to 150 field compressors, and from five to 15 sales compressors. Eight hundred to 2,400 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From 100 to 300 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There would be no more than 60 miles of sales lines laid to the main transmission lines. This would result in 7,000 to 12,000 acres of disturbance.

### Conventional

Based on historical drilling rates, one to five conventional wells could be drilled on the reservation in the next 20 years.

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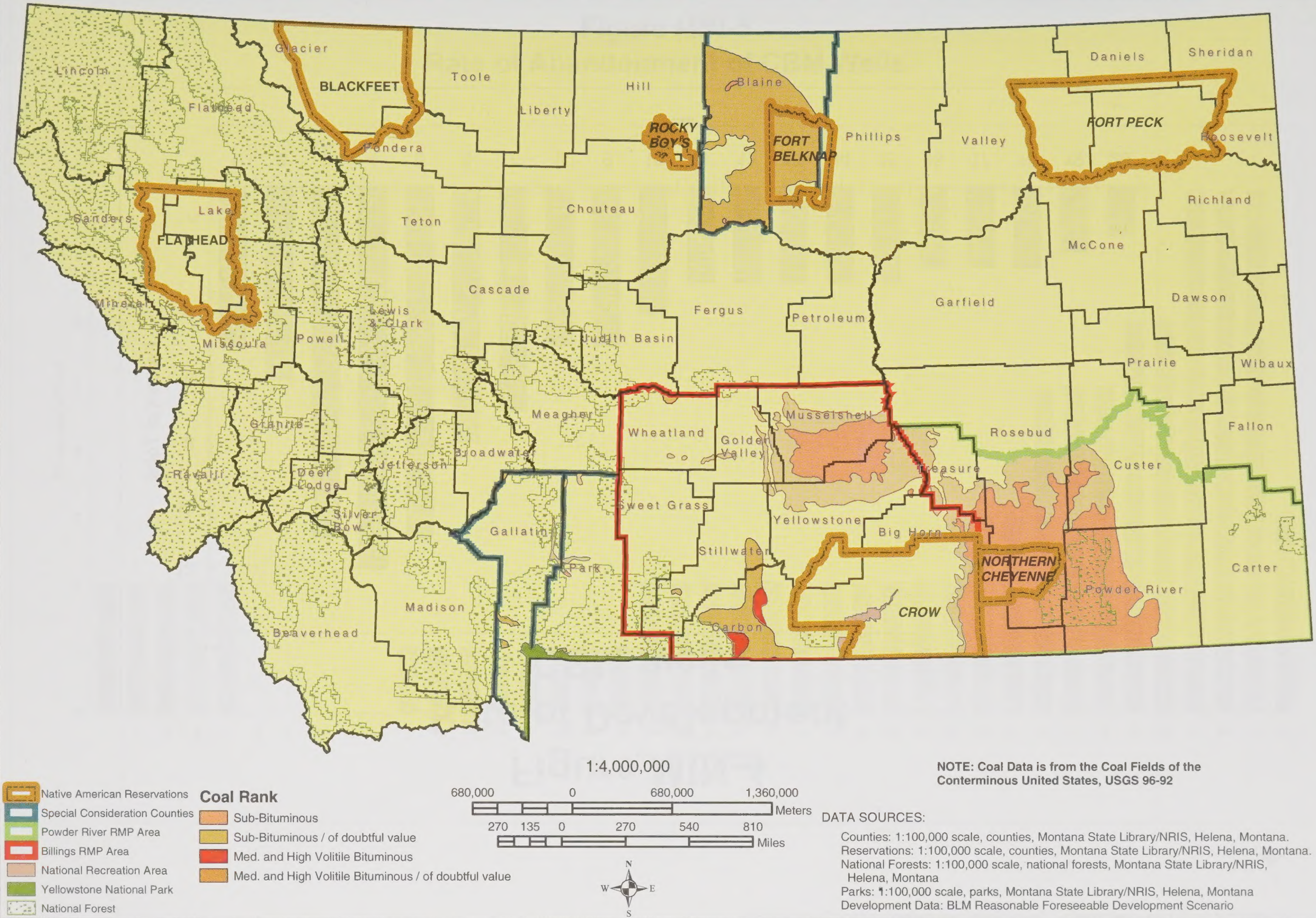
# MIN-1: Coal Rank RFD Map

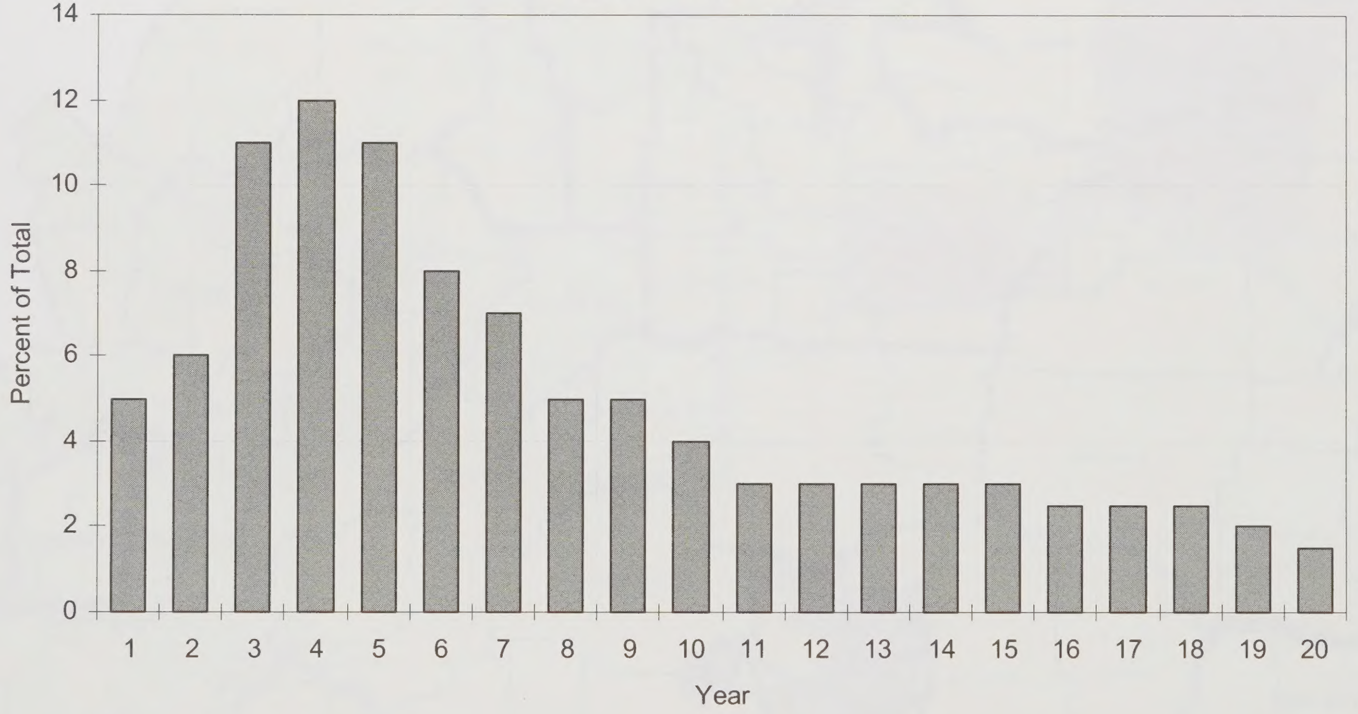

Lincoln
Flathead
Glacier
BLACKFEET
Toole
Liberty
Hill
Blaine
ROCKY BOY'S
FORT BELKNAP
Phillips
Valley
Daniels
Sheridan
FORT PECK
Roosevelt
Pondera
Sanders
Lake
FLATHEAD
Teton
Chouteau
Richland
McCone
Mineral
Missoula
Powell
Lewis & Clark
Cascade
Fergus
Petroleum
Garfield
Dawson
Judith Basin
Prairie
Wibaux
Granite
Meagher
Wheatland
Golden Valley
Musselshell
Rosebud
Fallon
Custer
Ravalli
Deer Lodge
Jefferson
Broadwater
Treasure
Silver Bow
Sweet Grass
Yellowstone
Gallatin
Big Horn
Stillwater
Park
NORTHERN CHEYENNE
Carter
Powder River
Madison
Carbon
CROW
Beaverhead
Native American Reservations
Special Consideration Counties
Powder River RMP Area
Billings RMP Area
National Recreation Area
Yellowstone National Park
National Forest
Coal Rank
Sub-Bituminous
Sub-Bituminous / of doubtful value
Med. and High Volitile Bituminous
Med. and High Volitile Bituminous / of doubtful value
1:4,000,000
680,000
0
680,000
1,360,000
Meters
270
135
0
270
540
810
Miles
N
W
E
S

**NOTE: Coal Data is from the Coal Fields of the Conterminous United States, USGS 96-92**

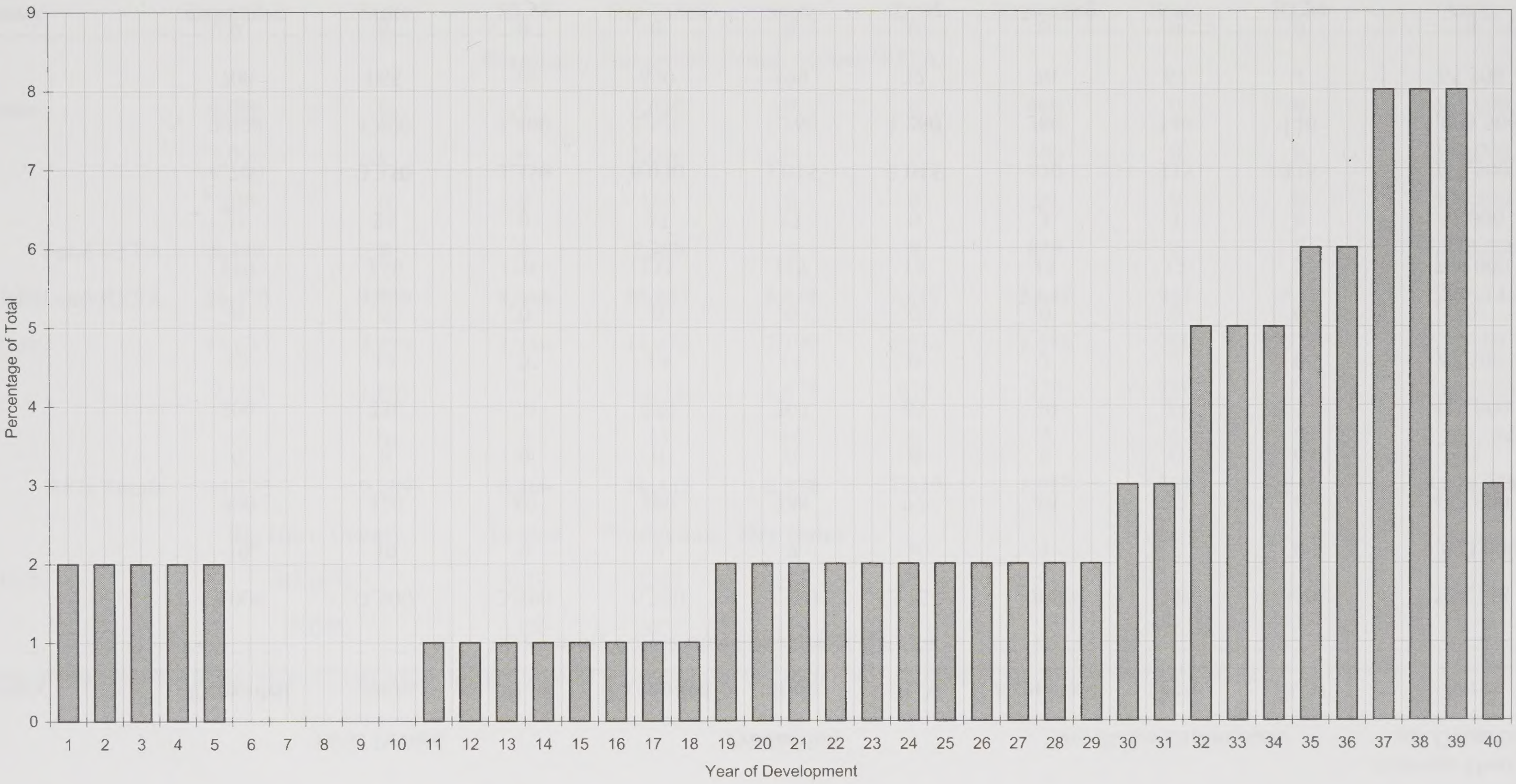
DATA SOURCES:

Counties: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana.
Reservations: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana.
National Forests: 1:100,000 scale, national forests, Montana State Library/NRIS, Helena, Montana
Parks: 1:100,000 scale, parks, Montana State Library/NRIS, Helena, Montana
Development Data: BLM Reasonable Foreseeable Development Scenario

Figure MIN-4
Rate of Development
CBM wells



## Figure MIN-5
## Rate of Abandonment of CBM Wells



## TABLE MIN-1
## RFD/RFFA NUMERICAL PREDICTIONS FOR EXPANDED CBM DEVELOPMENT SCENARIO

| | Total Drilled | | | Production | | | Dry Holes/Exploration | | | Acreage Overlying Coal Occurrences |
|---|---|---|---|---|---|---|---|---|---|---|
| **County** | **Expanded** | **State** | **BLM** | **Expanded** | **State** | **BLM** | **Expanded** | **State** | **BLM** | **Acres** |
| Reasonably Foreseeable Development (RFD) | | | | | | | | | | |
| Big Horn | 7,000 | 3,500 | 3,500 | 6,300 | 3,150 | 3,150 | 700 | 350 | 350 | 524,738 |
| Blaine | 10 | 10 | 0 | 9 | 9 | 0 | 1 | 1 | 0 | 1,024,000 |
| Carbon | 400 | 320 | 80 | 360 | 288 | 72 | 40 | 32 | 8 | 448,000 |
| Carter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Custer | 300 | 230 | 70 | 270 | 207 | 63 | 30 | 23 | 7 | 418,000 |
| Gallatin | 15 | 15 | 0 | 14 | 14 | 0 | 2 | 2 | 0 | 47,500 |
| Golden Valley | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Musselshell | 150 | 130 | 20 | 135 | 117 | 18 | 15 | 13 | 2 | 764,000 |
| Park | 25 | 25 | 0 | 23 | 23 | 0 | 3 | 3 | 0 | 32,000 |
| Powder River | 6,700 | 3,350 | 3,350 | 6,030 | 3,015 | 3,015 | 670 | 335 | 335 | 713,500 |
| Rosebud | 2,800 | 1,400 | 1,400 | 2,520 | 1,260 | 1,260 | 280 | 140 | 140 | 1,005,500 |
| Stillwater | 700 | 665 | 35 | 630 | 599 | 32 | 70 | 67 | 4 | 65,500 |
| Sweetgrass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Treasure | 25 | 24 | 1 | 23 | 22 | 1 | 3 | 2 | 0 | 153,500 |
| Wheatland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellowstone | 150 | 140 | 10 | 135 | 126 | 9 | 15 | 14 | 1 | 678,000 |
| **Total RFD** | **18,275** | **9,809** | **8,466** | **16,447** | **8,828** | **7,619** | **1,827** | **981** | **847** | **5,874,238** |

## TABLE MIN-1
## RFD/RFFA NUMERICAL PREDICTIONS FOR EXPANDED CBM DEVELOPMENT SCENARIO

| | **Total Drilled** | | | **Production** | | | **Dry Holes/Exploration** | | | **Acreage Overlying Coal Occurrences** |
|---|---|---|---|---|---|---|---|---|---|---|
| **County** | **Expanded** | **State** | **BLM** | **Expanded** | **State** | **BLM** | **Expanded** | **State** | **BLM** | **Acres** |
| | | | | Reasonably Foreseeable Future Actions (RFFA) | | | | | | |
| Northern Cheyenne | 4,000 | 0 | 0 | 3,600 | 0 | 0 | 400 | 0 | 0 | 445,000 |
| Crow | 4,000 | 0 | 0 | 3,600 | 0 | 0 | 400 | 0 | 0 | 332,000 |
| Forest Service | 200 | 0 | 0 | 180 | 0 | 0 | 20 | 0 | 0 | 501,500 |
| **Total RFFA** | **8,200** | **0** | **0** | **7,380** | **0** | **0** | **820** | **0** | **0** | **1,278,500** |
| **Total RFD and RFFA** | **26,475** | **9,809** | **8,466** | **23,827** | **8,828** | **7,619** | **2,647** | **981** | **847** | **7,286,144** |
| Powder River RMP | 15,635 | 7,899 | 7,716 | 14,072 | 7,109 | 6,944 | 1,564 | 790 | 772 | 2,726,033 |
| Billings RMP | 2,590 | 1,861 | 751 | 2,331 | 1,674 | 675 | 259 | 186 | 75 | 2,044,705 |
| Counties | 50 | 50 | 0 | 45 | 45 | 0 | 5 | 5 | 0 | 1,103,500 |
| **RFD Totals** | **18,275** | **9,809** | **8,466** | **16,447** | **8,828** | **7,619** | **1,827** | **981** | **847** | **5,874,238** |
| | **Big Horn County** | | **Drilled** | **Production** | **Dry Holes** | | | | | |
| Powder River RMP | 83.00% | | 5810 | 5229 | 581 | | | | | |
| Billings RMP | 17.00% | | 1190 | 1071 | 119 | | | | | |

Note: Percentages indicate portion of Big Horn county overlying known coal occurrence within each RMP excluding the Crow Reservation lands.

# CUMULATIVE PROJECTS EVALUATED

Compliance with the National Environmental Protection Act (NEPA) requires analysis of cumulative effects for each alternative. Cumulative effects on the environment are those that result from the incremental impacts of an alternative when added to the other past, present and reasonably anticipated future actions, regardless of who undertakes those actions. In analyzing cumulative effects from this project, it will be important to understand the incremental impacts from other past, present, and future actions planned for the RMP areas. However, not every project can be included in the analysis or the result could become cumbersome; thus, providing decision makers with extraneous information. Therefore, the importance of scoping cannot be overstressed because it provides the initial opportunity to identify boundaries for a meaningful analysis. The cumulative effects study approach is defined by discussing the Study Area Delineation (spatial boundary); past, present, and future projects that meet a minimum criteria of magnitude as to add to the cumulative effect and time frame for the analysis and is discussed in the conclusions section of each alternative.

## Study Area Delineation

The planning area for BLM is the Billings RMP area (10,791,964 acres) and the Powder River RMP area (8,567,125 acres). Acre estimates are for all land within the RMP's regardless of ownership, federal, state or private. The state planning area is statewide with emphasis on the BLM planning area and Blaine (2,711,407 acres), Park (1,788,816 acres), and Gallatin (1,683,586 acres) counties. The combination of the two RMP areas and three counties amounts to approximately 25 million acres.

The study area proposed for the environmental impact statement (EIS) RMP is exceptionally large and limits the type of analyses that can be included in the subject analysis. It is important to note that the objective of the cumulative analysis is not to perform the perfect analysis, but to select projects that would be appropriate to the subject analysis and aid in the selection of a preferred alternative. With this in mind, the objective is not to make an attempt to choose all projects throughout the entire state of Montana that might add to the cumulative effect of either BLM's or the state's action. This extreme is simply not practical; however, if the thought is more focused, cumulative impact analysis could be chosen on a practical level. Cumulative impacts that might affect other resources are not considered as regionally extensive, the projects/activities to consider may be different. For example, groundwater impacts would be limited to the general area of CBM production. This would also be the case with soils, agriculture and grazing, cultural and paleontological resources, geology and minerals, Indian trust assets, socioeconomics, and others. Other than air quality related impacts (including visual) and surface and ground water influences from Wyoming CBM development, BLM believes the proposed study area is appropriate for this plan and is consistent with other BLM plans. Using this approach, combined with the general knowledge of the area, consideration of a study area that is essentially the Powder River Basin is appropriate. We are, however, limited to some extent in what can be considered and must strive to choose those areas and projects and activities that are truly applicable to the process.

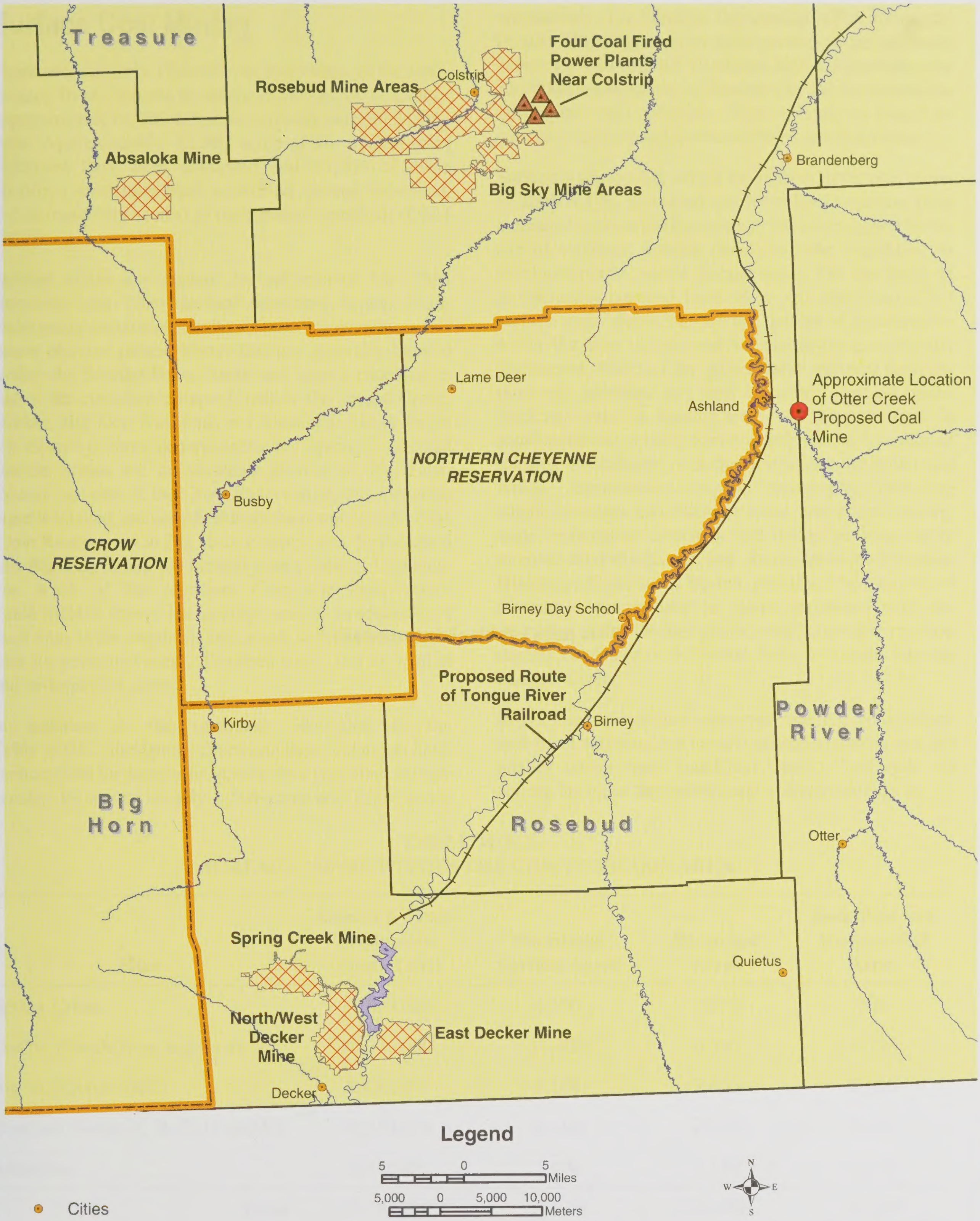
As such, the cumulative analysis for this EIS will emphasize impacts from oil and gas industry-related projects within the project study area and appropriate adjacent areas, depending on the resource being analyzed. The cumulative analysis also considered impacts from the largest foreseeable non-oil and gas industry developments. Activities and projects of sufficient magnitude that may result in cumulative impacts to the environment include natural gas and oil production; surface coal mining; railroads; highways; water storage reservoirs; power plants; potential wildfires; and effects from CBM development in Wyoming, the Ashland Ranger District and on the Crow and Northern Cheyenne reservations. Map MIN-2 indicates the locations of projects included in the cumulative effects analysis.

A discussion of each project or type included in the cumulative effects analysis follows.

## Natural Gas and Oil Production

Impacts from conventional natural gas and oil production are addressed in the *Impacts from Management Common to All Alternatives* discussion under the individual resource topic section of the *Impacts From Management Specific to Each Resource and Alternative*. The impacts from conventional oil and gas development are consistent with the BLM's 1994 *Final Oil and Gas EIS RMP Plan Amendment* to the Billings, Powder River, and South Dakota RMPs, and the state's 1989 *Oil and Gas Drilling and Production in Montana Final EIS.*

## MIN-2: Location Map of Cumulative Effects Projects With CBM Emphasis Area


Treasure
Four Coal Fired Power Plants Near Colstrip
Colstrip
Rosebud Mine Areas
Absaloka Mine
Big Sky Mine Areas
Brandenberg
Lame Deer
Ashland
Approximate Location of Otter Creek Proposed Coal Mine
NORTHERN CHEYENNE RESERVATION
Busby
CROW RESERVATION
Birney Day School
Proposed Route of Tongue River Railroad
Birney
Kirby
Powder River
Big Horn
Rosebud
Otter
Spring Creek Mine
Quietus
North/West Decker Mine
East Decker Mine
Decker
Legend
5 0 5 Miles
5,000 0 5,000 10,000 Meters
N
W
E
S

● Cities

— Rivers

▨ Coal Mines

▭ Native American Reservations

DATA SOURCES

County Boundaries: 1:100,000 scale, Counties, Montana State Library/NRIS, Helena, Montana.
Cities: 1:100,000 scale, Cities, Montana State Library/NRIS, Helena, Montana.
Mines: Montana Bureau of Mines & Geology.
Otter Creek Site: EMRIA Report #1, 1975.

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## Surface Coal Mining

There are currently 12 active surface mines in the state, ranging from 10 acres to nearly 25,000 acres. A total of approximately 61,000 acres are currently permitted in the state. Approximately 32,000 acres of the 61,000 acres permitted have been disturbed and 15,000 of these disturbed acres have been backfilled, graded, topsoiled, and permanently seeded to reclamation standards (OSM 1998).

Several mines are present in and around the CBM emphasis area. They include operating mines, mines undergoing expansion, reclamation of older mines, and future planned mines. Mines that are generally located within the Powder River Basin and have a potential to add to the cumulative impact include the Spring Creek, Decker, Big Sky, Rosebud, and Absaloka. These mines are located in three general areas: the Spring Creek and Decker mines are in southeast portion of Big Horn County just east of the Crow Reservation; the Absaloka mine is located just outside the northeastern corner of the Crow Reservation in Big Horn County; and the Rosebud and Big Sky mines are located near Colstrip, Montana, just north of the Northern Cheyenne Reservation. Table MIN-2 shows the average annual production of each mine in the emphasis area along with environmental data for permitted acres, disturbed acres, and backfilled and re-topsoiled acres.

In addition to the quantities identified in the Table MIN-2, the Spring Creek and Rosebud mines have each applied for permits to expand their permitted surface acreage by approximately 2,500 acres and 1,500 acres, respectively. The Montana Department of Environmental Quality (MDEQ) expects both permits to be approved before the end of 2001 (Bohman 2001). Approximately 32,900 acres remain to be disturbed by mining operations during the next 20 years. This estimate is based on current activities and foreseen future developments.

Surface water quality within the vicinity of the coal mines is impacted by increased sediment load resulting from increased erosion during mining. This is mitigated by the use of sediment settling ponds and the vegetating of overburden and topsoil storage areas. The discharge of groundwater pumped from mine pits may also affect surface water depending on the quality of groundwater within the mine vicinity and the quantity of groundwater discharged. Much of the groundwater pumped from the mine pits is stored and used to control dust on roads, truck and train car loading areas, and the mine face. In some instances, mining activities require the diversion of streams or drainage areas that are within the area to be mined. Approximate original topography, including stream channels and drainage areas, are restored during mine reclamation activities. All mines are required to monitor their discharges and obtain Montana Pollution Discharge Elimination System permits. The majority of discharges are related to storm responses with the exception of the Decker mines, which has a permit for a regular discharge of 4.5 cubic feet per second into the Tongue River.

Impacts to groundwater resources resulting from surface coal mine activities are usually related to drawdown and quality issues from backfilled spoils. Coal beds are among the most dependable and utilized aquifers in

**TABLE MIN-2**
**SURFACE MINES WITHIN THE CBM EMPHASIS AREA**

| Mine | Annual Average Production (Short Tons) | Permitted Surface Acres | Disturbed Acres | Backfilled and Re-topsoiled Acres |
|---|---|---|---|---|
| Spring Creek | 11,000,000 | 4,500 | 2,300 | 300 |
| Decker (North/West and East) | 10,000,000 | 11,400 | 6,300 | 1,700 |
| Big Sky (Area A&B) | 2,850,000 | 8,100 | 3,600 | 2,600 |
| Rosebud (Areas A, B, C, D, and E) | 10,350,000 | 24,900 | 13,050 | 6,400 |
| Absaloka | 5,500,000 | 5,400 | 3,150 | 2,200 |
| **Total** | 39,700,000 | 54,300 | 28,400 | 13,200 |

Note: This table shows the cumulative disturbances and reclamation efforts associated with each of the surface mining operations within the CBM Emphasis Area.

eastern Montana, because of their fracture-related transmissivity and lateral continuity. Adjacent portions of these aquifers discharge water into the mining pit, which requires that it be pumped-off resulting in the lowering of the water levels within aquifers adjacent to the mine. The area affected and the distance from the mine affected depends on the particular aquifer characteristics of the area, presence of faults, rates of surface water and precipitation recharge, and other factors, and will vary depending on the location of the mine. Groundwater wells, springs, and surface streams within the area can be impacted by the lowered water levels. Those located nearest the mine experience the greatest impact. In the mining areas near Colstrip and Decker, coal aquifers have shown drawdown as much as 75 feet and a radius of impact up to 4 miles (Wheaton and Metesh 2001). The resulting total area of groundwater impact from coal mines is calculated to be 366,000 acres. The rate at which water levels recover varies between mining regions, but normally requires more than 20 years (Wheaton and Van Voast 1998).

Overburden replaced in the mine pits during reclamation is approximately inverted from its original orientation. The mineral content of these near-surface unsaturated and weathered rock layers used in typical overburden affect the groundwater quality within the area of the reclaimed mines. The resulting poor water quality is present for many years after mining is completed. Elevated levels of sodium, magnesium, calcium, bicarbonate, chlorides, and sulfates are possible, as well as increased total dissolved solids (TDS). Dissolution of these salts causes increases in TDS concentrations in the spoils aquifers that have been observed at levels 50 percent to 200 percent greater than the adjacent bedrock aquifers (Wheaton and Van Voast 1998). With time, some sites return to pre-mining quality; however, the impacts to water quality may be everlasting at other sites where soluble salts are continuously generated by weathering and oxidation.

## Coal Mine Impacts on Air Quality

Coal mines have an effect on air quality within the region surrounding the surface operations. Air pollutant emissions data are available for five surface coal mines within the emphasis area; three are in Big Horn County (Absaloka, Spring Creek, and Decker mines), and two are in Rosebud County (Big Sky and Rosebud mines). Table MIN-3 shows the average air pollutant emissions from the mines within the emphasis area. Volatile organic compounds (VOCs) shown in the table would also include any fugitive methane vented from the mines.

Future impacts also would be realized from opening new mines, expanding existing mines, and installing power generation plants at existing coal mines.

## Highways

There are no current proposals for new highways within the CBM emphasis area. It is assumed that several secondary highways, state routes, and county roads will undergo some form of repair, resurfacing, widening, or extension during the course of CBM development. Currently, a list of proposed road improvements within the CBM emphasis area is not available for analysis and quantification. These activities, however, would subject the adjacent lands to impacts associated with linear construction and surface disturbances. For the purposes of this analysis, we are assuming that 250 miles of existing road would be improved over the next 20 years.

**TABLE MIN-3**
**AVERAGE AIR POLLUTANT EMISSIONS FROM SURFACE MINES WITHIN THE EMPHASIS AREA (TONS/YEAR)**

| Source | $PM_{10}$[1] | $CO$[2] | $NO_2$[3] | $SO_2$[4] | VOCs[5] |
|---|---|---|---|---|---|
| Existing Coal Mines (5)—Avg/Mine | 412.1 | 323.4 | 290.2 | 56.5 | 18.8 |

Notes: This table summarizes the impacts to air quality from surface mining sources within the emphasis area (MDEQ—1999 Air Quality Monitoring Data). Values were obtained from 1999 Toxic Release Inventory for the State of Montana.

[1] $PM_{10}$—Particulate matter that is less than or equal to 10 microns in size.

[2] CO—Carbon monoxide

[3] $NO_2$—Nitrous oxides

[4] $SO_2$—Sulfur dioxide

[5] VOCs—Volatile organic compounds

## Water Storage Reservoirs

The Tongue River flows about 100 miles from its headwaters in Wyoming's Bighorn Mountains to the Tongue River Reservoir. The reservoir is approximately 8 miles long and 1 mile wide, with an average depth of 20 feet, and was completed in 1940. Water leaving the north end of the reservoir flows about 190 miles, northeasterly, until it reaches its confluence with the Yellowstone River at Miles City.

The reservoir was enlarged in 1999, at the request of the Department of Natural Resources and Conservation (DNRC), Northern Cheyenne Tribe, and the U.S. Bureau of Reclamation. The enlargement included the reconstruction of the dam and disturbance of 157 acres. The disturbance included aggregate mining, roads, staging areas, and railroad layout areas, some of which have been reclaimed. As a result of the enlargement, the reservoir capacity was increased by 13,000 acre-feet, the surface water level raised by 4 feet, and the surface area expanded by some 400 acres to nearly 3,615 acres.

## Power Generation Plants

Five existing power generation plants are located within the CBM emphasis area, and all are coal-fired. Four are located in Rosebud County near the coal mine area and one is located in Billings. The resource area most affected by the burning of coal to produce electrical power is air quality. Air quality data from all five power generation plants are available. Table MIN-4 summarizes the impacts to air quality from these plants within the emphasis area, according to the MDEQ 1999 Air Quality Monitoring Data.

There are plans to construct a coal gasification power plant in Hardin, Montana. The plant would be retrofitted into an existing manufacturing facility, resulting in reduced surface disturbances. It is understood the plant plans to use approximately 500,000 tons of coal per year supplied by the Absaloka mine, 20 miles east of Hardin. Additional information regarding the coal gasification process, estimated emission levels, and the power generation process is not available at this time.

Other power plants maybe envisioned due to the electrical industry's deregulation and the increased demand nation wide. Some of these plants may find it advantageous to locate in Montana near a source of coal or natural gas; however, no new plants were presented to the DEQ for permitting at the time of new data cut-off, June 2001.

## Wildfires

The BLM Fire Management Program suppresses wildfires and uses prescribed fires to achieve land management objectives. Nationally, 63 percent of wildfires are caused by lighting and the remaining 37 percent by human activities. The average wildfire consumes approximately 370 acres, but the acreage can more than double in severe years that have drought, high winds, or above normal lightning.

Prescribed fires are carefully planned to remove old, woody vegetation, prepare areas for reseeding, or reduce the natural accumulation of dead vegetation. They make room for growth of more nourishing forage for livestock and wildlife, and are often designed to burn a mosaic pattern, leaving patches to serve as cover for some wildlife species. The average prescribed fire covers 150 acres of land. Based on previous RMPs, it is estimated that 25 wildfires would occur per year in the planning area. The fires would range in size from 1/4 acre

**TABLE MIN-4**
**AVERAGE AIR POLLUTANT EMISSIONS FROM FIVE MAJOR SOURCES WITHIN THE EMPHASIS AREA**
**(TONS/YEAR)**

| Source | $PM_{10}$[1] | CO[2] | $NO_2$[3] | $SO_2$[4] | VOCs[5] |
|---|---|---|---|---|---|
| Existing Power Plants (5)—Avg/Plant | 55.0 | 453.1 | 5036.2 | 3065.5 | 54.1 |

Note: Values were obtained from 1999 Toxic Release Inventory for the State of Montana.
[1] $PM_{10}$—Particulate matter that is less than or equal to 10 microns in size
[2] CO—Carbon monoxide
[3] $NO_2$—Nitrous oxides
[4] $SO_2$—Sulfur dioxide
[5] VOCs—Volatile organic compounds

to 1,000 acres. Surface disturbances caused from fire lines would average 3 acres per fire or a total of 75 acres per year.

## Wyoming CBM Production

CBM production in Wyoming is concentrated in the Powder River Basin. CBM resources of the Powder River Basin are more extensively developed in Wyoming than in Montana. Most of the surface area of the basin is located in Wyoming, with 92 percent of the coal volume located in the Powder River basin lying within Wyoming (Ellis et al., 1999). The CBM development in Wyoming has the potential to impact water resources in Montana through the drawdown of groundwater within coal seam aquifers that extend from Wyoming north into Montana and by the discharge of CBM-produced waters in Wyoming to surface waters that flow north into Montana. The potential magnitude of the impact to Montana water resources from Wyoming CBM production is tied to the RFD of CBM in Wyoming. Projections for the RFD of CBM in the Wyoming portion of the Powder River basin adjacent to Montana have been the subject of recent BLM reports.

CBM development in Wyoming has the potential to cause substantial impacts in Montana to surface water quality and groundwater resources. The Wyoming DEQ and the Montana DEQ have adopted an interim memorandum of cooperation on limiting discharge to watersheds that extend into Montana, the probability of future agreements is tentative.

The *Coalbed Methane Project Final EIS (Wyodak EIS)* (BLM 1999b) projected 6,000 CBM wells in the Buffalo Field Office Area. The water model, done as part of the EIS, estimated an average production rate of 12 gpm per CBM well. This level of development was estimated to result in an increase of approximately 1.1 percent (452 cfs to 457 cfs) in the average flow volume of the Powder River at Moorhead, Montana (BLM 1999b), and an increase of approximately 50 percent (22 cfs to 33 cfs) in the average flow volume in the Little Powder River at the Weston station, which is located approximately 20 miles south of the Wyoming/Montana border. These increases are based on yearly averages. However, during low-flow periods, the Powder River flow volume could be increased by more than 800 percent as a result of the discharge of CBM-produced waters. Flow volumes in the Little Powder River would consist entirely of discharged CBM-produced waters (BLM 2001b).

The quality of CBM produced water from individual wells in the Wyoming portion of the PRB shows considerable variability (Rice et al, 2000); water quality parameters such as SAR vary from approximately 5 to over 30 and TDS varies from approximately 250 million gallons per liter (mg/L) to more than 2000 mg/L. Watershed averages in Wyoming also show variation (BLM, 1999b.); water quality parameters such as SAR vary from an average of 17 in the Powder River Watershed to 9 in the Little Powder River watershed. As CBM development continues in Wyoming, these average water quality parameter values may change. Surface water quality would be affected by CBM water discharge, with yearly average SAR values increasing from 4.0 to 4.1 in the Powder River and from 6.0 to 7.5 in the Little Powder River. Impact to the quality of water within the Powder River during low-flow periods is expected to increase water quality concentrations for compounds common to CBM produced water, including increases in the SAR from values that could be as low as 1 up to approximately 17. During low-flow periods in the Little Powder River, SAR is expected to increase from approximately 6.5 to an estimated value of approximately 9. The Wyoming EIS (BLM, 1999b.) did not address potential impacts to the Tongue River from discharge of CBM-produced waters within Wyoming. However, it is expected that impacts of similar magnitude to those predicted for the Powder and Little Powder could occur.

Following the release of the Wyodak EIS (BLM 1999), the BLM has reassessed the RFD for the Wyoming portion of the Powder River Basin and has issued a new RFD (BLM 2001a). This more recent reasonably foreseeable development study by the BLM indicates that the total number of CBM wells in the Wyoming portion of the Powder River Basin may approach 50,000 wells (BLM 2001a). An EIS using this level of development is in progress, but some extrapolations can be made from the existing EIS. This level of development represents an increase of more than 8 times the number of CBM wells included in the 1999 Wyodak EIS, and if realized, could have a corresponding increase in impact on the quantity and quality of surface water in Montana's Powder River Basin watersheds in terms of annual average measures and especially during periods of low-flow or base-flow. However, actual impacts will be dependant upon the manner in which discharges are managed with respect to CBM development in Wyoming.

Rivers within the Wyoming portion of the PRB show considerable seasonal variation in terms of flow volume and water quality. The flow volume in the Powder River ranges from a maximum of 1,400 cubic feet per second (cfs) to a minimum of 0.5 cfs. Water quality also varies because flow volume contains varying amounts of meteoric water added to the base-flow contributed by groundwater. If CBM water discharge rates are essentially constant throughout the year, resultant flows in the river would vary depending upon the ratio of CBM discharge to natural river flow. Impacts to the Powder

River would include a 9 percent increase in the annual average flow volume (450 cfs to 500 cfs), as well as an increase in the annual average SAR value to 5.2. Impacts during natural low-flow periods, however, would cause the river to flow at rates 70 times normal with SAR values in excess of 17.

Annual average flow within the Little Powder River with the impact of CBM discharge water is extrapolated to increase from 22 cfs to 92 cfs and a resultant SAR of 9. Depending on how CBM-discharges are managed in Wyoming, these flow rates and water qualities could be maintained during traditionally low-flow periods when the river is normally often dry.

Impacts to the Tongue River drainage are not included in the Wyodak EIS, however, impacts to surface water quantity and quality resulting from the increase in the number of CBM wells and the resultant increase in the volume of CBM water discharged in Wyoming are possible. The Upper Tongue River watershed is currently the site of CBM production and it is expected that more development would occur. Impacts to the Tongue River in Montana are expected to be commensurate with impacts to the Powder and Little Powder Rivers by Wyoming CBM production. These impacts would result in increases in surface water quantity and decreases in quality. This could result in 3 to 5 times more water entering Montana and an increase in SAR from 0.7 to 5. This is important because Tongue River water quality is the highest in the PRB and the river feeds the Tongue River Reservoir.

Groundwater resources in Montana could also be impacted from CBM production in Wyoming. CBM-producing wells in northern Wyoming would cause a drawdown of coal aquifers on adjacent land, with groundwater drawdown possibly extending northward into Montana. Groundwater computer modeling for the Wyodak EIS indicates that the 5-foot drawdown level could extend up to 18 miles from the edge of production, given a 12-gpm per well rate of water withdrawal (BLM 1999). The modeling values are based on assumptions made regarding the known geology of the Wyoming portion of the basin, which field data has shown to differ from the Montana portion of the basin. The Wyoming coal seams that have been developed are deeper and thicker than the seams in Montana. In addition, the 12-gpm water production value for the state was a "snap-shot" derived from current production data at a single point (1997) early in the life of the PRB CBM play. The 20-year average rate of 2.5 gpm for Montana was derived from carefully organized data from a single CBM field considering production trends with time. Nonetheless, both the 12 gpm and the 2.5 gpm rates are projections that may need to be monitored and refined over time as CBM development proceeds. Given these groundwater modeling results and related assumptions, if CBM fields were located in Wyoming adjacent to the border with Montana, this could affect groundwater levels for a distance of up to 18 miles into Montana, assuming the parameters used in the Wyoming computer model are applicable to this area of Montana. Drawdown impacts of this magnitude would result in impacts to private lands, the Crow Indian Reservation, state-owned lands, and federal lands controlled by BLM.

## CBM Development on Indian Reservations and the Ashland Ranger District

The development of CBM resources on the Crow and Northern Cheyenne reservations and on the Ashland Ranger District is assumed to take place during the next 20 years and is therefore included in the cumulative effects analysis. The RFD estimated that 1,400 to 4,000 wells could be developed on each reservation and 50 to 200 wells on the Ashland Ranger District. The impacts associated with this development would be similar to the impacts described within each of the resource topics per alternative and adjusted for magnitude. Of course, the land disturbances, wildlife, cultural and paleontological, visual, social economic, recreational, air quality, soils, and special status species impacts described for those resources would be experienced on the reservations and on the Ranger District. The surface and groundwater quality impacts would be felt on the reservations and on the District but they would also contribute to changes in the watersheds into which the flow.

# Land Management Agency-Approved Natural Resource Mitigation Measures

Mitigation measures are restrictions on lease operations, which are intended to minimize or avoid impacts to resources or land uses from oil and gas activities. The mitigation measures listed in Table MIN-5 would be applied to permits, leases or approvals granted by the land management agency. The list is not all inclusive, but presents the mitigation measures most often used in the planning area. The wording of the mitigation measure may be modified or additional measures may be developed to address specific conditions. Mitigation measures would be included as appropriate to address site-specific concerns during all phases of CBM development.

**TABLE MIN-5**
**MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS**

| Mitigation Measure | BLM | TLMD |
|---|---|---|
| Disturbed areas resulting from any construction will be seeded following the BLM seeding policy, state guidance or surface owner's requirements. Depending on surface ownership seeding is usually required during the fall or late spring. | X | |
| To the extent practicable, vegetation will be preserved and protected from construction operations and equipment except where clearing operations are required to conduct oil and gas operations, such as for roads, well pads, pipelines, power lines, utility lines, and structures. Clearing of vegetation will be restricted to the minimum area needed for construction and equipment. | X | |
| Temporary and permanent access roads will be avoided on south-facing slopes within big game winter range, where practicable. | X | |
| To the maximum extent practicable, all maintenance yards, field offices, and staging areas will be arranged to minimize disturbance to trees, shrubs, and other native vegetation. | X | |
| Topsoil removed by construction activities will be stockpiled for reclamation. Sensitive habitat areas will not be used for topsoil storage. | X | |
| The planting of grasses, forbs, trees, or shrubs beneficial to wildlife will follow the BLM seeding policy. When needed, BLM will require installation of erosion and sedimentation control measures, such as riprap, erosion mats, mulch, bales, dikes or water bars. Riprap material and placement must be approved by the appropriate agency. | X | |
| Erosion control and site restoration measures will be initiated as soon as a particular area is no longer needed for exploration, production, staging, or access. Disturbed areas will be recontoured to provide proper drainage. | X | |
| Topsoil piles may be required to be seeded following the BLM seeding policy. | X | |
| All above-ground electrical poles and lines will be raptor-proofed to avoid electrocution following the criteria and outlined in the Avian Power Line Interaction Committee (APLIC) (1994) and APLIC (1996). (APLIC 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington D.C. 78 pp.; APLIC 1996. Suggested Practices for Raptor Protection on Power Lines. Edison Electric Institute. Washington, D.C. 128 pp.). | X | |

### TABLE MIN-5
### MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

| Mitigation Measure | BLM | TLMD |
|---|---|---|
| Conduct three nesting habitat surveys for mountain plover in suitable habitat between May 1 and June 15. Surface use may be deleted in accordance with 43 CFR 3101.1-2. | X | |
| The Surface Management Agency is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Guidance for application of this requirement can be found in NTL-MSO-85-1. | X | |
| Cuts and fills for new roads will be sloped to prevent erosion and to facilitate revegetation. | X | |
| It is the responsibility of the operator to control noxious weeds on lands disturbed in association with oil and gas lease operations. Lease-associated weed control strategies, when required by BLM, are to be coordinated with any involved surface owners and local weed control boards. A pesticide-use proposal must be prepared, and reviewed and approved by BLM prior to any herbicide application on lands disturbed by federal oil and gas lease operations. A pesticide application record must be within 24 hours after completion of application of herbicides. Additional measures may be required to prevent the spread of noxious weeds. | X | |
| Activities such as stream crossings that could directly impact sensitive or protected fish species will be undertaken during non-spawning periods for these species. In the unlikely event that multiple, sensitive, or protected fish species with back-to-back spawning periods are present in the same stream reach, one of the following options will be exercised. These options include selecting a nearby, alternative stream crossing site that does not provide suitable spawning habitat for the fish species of concern; using a nearby, existing stream crossing over the channel to avoid instream disturbances; or using shore-based equipment to position and extend the pipeline or other item (e.g., temporary bridge) across the stream, thereby avoiding in-channel activities. | X | |
| Operators must develop a Spill Prevention Control and Countermeasures plan to deal with accidental spills, the plan would include the strategic placement of berms and dikes. | X | |
| The road ditches would be flat bottomed and "V" ditches would not be allowed. Place water turn outs where appropriate to lessen the water impacts upon the ditches. | X | |

### TABLE MIN-5
### MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

| Mitigation Measure | BLM | TLMD |
|---|---|---|
| Prior to surface disturbance on slopes over 30 percent, an engineering/reclamation plan must be approved by the authorized officer. Such plan must demonstrate how the following will be accomplished:<br>• Site productivity will be restored.<br>• Surface runoff will be adequately controlled.<br>• Off-site areas will be protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting.<br>• Water quality and quantity will be in conformance with state and Federal water quality laws.<br>• Surface-disturbing activities will not be conducted during extended wet periods.<br>• Construction will not be allowed when soils are frozen. | X | |
| Surface occupancy and use is prohibited within existing coal leases with approved mining plans. | X | |
| Surface occupancy and use is prohibited within riparian areas, 100-year flood plains of major rivers, and on water bodies and streams. | X | |
| Surface use is prohibited from December 1 to March 31 within crucial winter range for wildlife. This stipulation does not apply to the operation and maintenance of production facilities. | X | |
| Surface use is prohibited from April 1 to June 15 within established spring calving range for elk. This stipulation does not apply to the operation and maintenance of production facilities. | X | |
| Surface occupancy is prohibited in the designated Bighorn Sheep Range. | X | |
| Surface occupancy and use is prohibited within ¼ mile of grouse leks. | X | |
| Surface use is prohibited from March 1 to June 15 in grouse nesting habitat within 2 miles of a lek. This stipulation does not apply to the operation and maintenance of production facilities. | X | |
| Surface use is prohibited from March 1 – August 1, within ½ mile of raptor nest sites which have been active within the past 2 years. This stipulation does not apply to the operation and maintenance of production facilities. | X | |
| Surface occupancy and use is prohibited within ¼ mile of designated reservoirs and fisheries. | X | |
| The “Draft Guidelines for Oil and Gas Activities in Prairie Dog Ecosystems Managed for Black-footed ferret Recovery” (FWS, 1990) will be used as appropriate to develop site-specific conditions of approval to protect black-footed ferret reintroduction and recovery. Specific conditions of approval will depend on type and duration of proposed activity, proximity to occupied ferret habitat, and other site-specific conditions. | X | |

### TABLE MIN-5
### MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

| Mitigation Measure | BLM | TLMD |
|---|---|---|
| Prior to surface disturbance, prairie dog colonies and complexes 80 acres or more in size will be examined to determine the absence or presence of black-footed ferrets. The findings of this examination may result in some restrictions to the operator's plans or may even preclude use and occupancy that would be in violation of the Endangered Species Act (ESA) of 1973. The lessee or operator may, at their own option, conduct an examination on the leased lands to determine if black-footed ferrets are present, or if the proposed activity would have an adverse effect, or if the area can be cleared. This examination must be done by or under the supervision of a qualified resource specialist approved by the Surface Management Agency (SMA). An acceptable report must be provided to the SMA documenting the presence or absence of black-footed ferrets and identifying the anticipated effects of the proposed action on the black-footed ferret and its habitat. This stipulation does not apply to the operation and maintenance of production facilities. | X | |
| Surface occupancy and use is prohibited within ½ mile of known bald eagle nest sites which have been active within the past 7 years and within bald eagle nesting habitat in riparian areas. | X | |
| Surface occupancy and use is prohibited within 1 mile of identified peregrine falcon nesting sites. | X | |
| Surface occupancy and use is prohibited within ½ mile of known ferruginous hawk nest sites which have been active within the past 2 years. | X | |
| Surface occupancy and use is prohibited within ¼ mile of wetlands identified as piping plover habitat. | X | |
| Surface occupancy and use is prohibited within ¼ mile of wetlands identified as interior least tern habitat. | X | |
| Surface occupancy and use is prohibited within sites or areas designated for conservation use, public use, or sociocultural use. | X | |
| Surface occupancy and use is prohibited within designated paleontological sites. | X | |
| Surface occupancy and use is prohibited within developed recreation areas and undeveloped recreation areas receiving concentrated public use. | X | |
| All surface-disturbing activities, semipermanent and permanent facilities in VRM Class II, areas may require special design, including location, painting, and camouflage, to bend with the natural surroundings and meet the visual quality objectives for the area. | X | |
| Geophysical exploration for oil and gas will not be allowed in the East Pryor Mountains, and Petroglyph Canyon areas of the Billings RMP area. | X | |
| Geophysical exploration for oil and gas will be allowed on designated roads and trails with restrictions in the Battle Butte, Finger Buttes, and Reynolds Battlefield areas of the Powder River RMP area. | X | |

### TABLE MIN-5
### MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

| Mitigation Measure | BLM | TLMD |
|---|---|---|
| Underground explosives for geophysical exploration for oil and gas exploration will not be allowed in the Bridger Fossil area of the Billings RMP area. Other geophysical exploration methods for oil and gas will be allowed at Bridger Fossil if the method will not damage the paleontology resource. If monitoring indicates fossil damage as a result of geophysical activity, it will no longer be allowed. | X | |
| Geophysical exploration for oil and gas will not be allowed on the significant cultural resource sites of the Castle Butte and Stark Site areas of the Billings RMP area. Geophysical exploration will be allowed (surface methods and vibroseis) in the remainder of the ACEC. | X | |
| In the sensitive plant areas of the Meeteetse Spires of the Billings RMP area, geophysical exploration for oil and gas will not be allowed by any method. On the remaining area of the Meeteetse Spires, geophysical exploration will be accessed by air only. Exploration will be shot holes and above-ground shots. Vibroseis will not be allowed. | X | |
| Lessee shall notify and obtain approval from the Department's Trust Land Management Division (TLMD) prior to constructing well pads, roads, power lines, and related facilities that may require surface disturbance on the tract. Lessee shall comply with any mitigation measures stipulated in TLMD's approval. | | X |
| Prior to the drilling of any well, lessee shall send one copy of the well prognosis, including Form 22 "Application for Permit" to the Department's Trust Land Management Division (TLMD). After a well is drilled and completed, lessee shall send one copy of all logs run, Form 4A "Completion Report", and geologic report to TLMD. A copy of Form 2 "Sundry Notice and Report of Wells" or other appropriate Board of Oil and Gas Conservation form shall be sent to TLMD whenever any subsequent change in well status or operator, is intended or has occurred. Lessee shall also notify and obtain approval from the TLMD prior to plugging a well on the lease premises. | | X |
| Issuance of this lease in no way commits the Land Board to approval of coal bed methane production on this lease. Any coal bed methane extraction wells would require subsequent review and approval by the board. | | X |
| The TLMD will complete an initial review for cultural resources and, where applicable, paleontological resources of the area intended for disturbance and may require a resources inventory. Based on the results of the inventory, the TLMD may restrict surface activity for the purpose of protecting significant resources located on the lease premises. | | X |
| The lessee shall be responsible for controlling any noxious weeds introduced by Lessee`s activity on State-owned land and shall prevent or eradicate the spread of those noxious weeds onto land adjoining the lease premises. | | X |
| The lessee is responsible to pay for all damages, including penalties and charges assessed by the USDA-CFSA on CRP lands, as a result of drilling and production on the tract. All damages will be assessed by and paid directly to the TLMD. | | X |

### TABLE MIN-5
### MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

| Mitigation Measure | BLM | TLMD |
|---|---|---|
| This lease includes areas that may be environmentally sensitive. Therefore, if the lessee intends to conduct any activities on the lease premises, the lessee shall submit to TLMD one copy of an Operating Plan or Amendment to an existing Operating Plan, describing in detail the proposed activities. No activities shall occur on the tract until the Operating Plan or Amendments have been approved in writing by the Director of the Department. TLMD shall review the Operating Plan or Amendment and notify the lessee if the Plan or Amendment is approved or disapproved. | | X |
| After an opportunity for an informal hearing with the lessee, surface activity may be denied or restricted on all or portions of any tract if the Director determines in writing that the proposed surface activity will be detrimental to trust resources and therefore not in the best interests of the trust. | | X |
| This tract contains navigable river beds. No surface occupancy is allowed within the bed of the navigable river, abandoned channels, or on islands and accretions. In addition, upon completion of a successful well, where river title is disputed, the lessee will file an interpleader action under Rule 22, M.R.Civ.P. in the Montana District Court in which the leased lands are located for all acreage within the lease in which the title is disputed. The lessee shall name all potential royalty claimants as defendants. | | X |
| Lessee must contact the owner of the surface in writing at least 30 days prior to any surface activity. A copy of the correspondence shall be sent to TLMD. | | X |
| No surface occupancy shall be allowed on this tract unless otherwise approved in writing by the Director of DNRC. | | X |
| No surface occupancy shall be allowed on any portion of this tract which is indicated as right-of-way on the official highway plans on file at the Department of Transportation in Helena, Montana without prior written approval from TLMD. | | X |
| It is the opinion of the TLMD that drainage is occurring on the land described in this lease and that if a well is not drilled within two years after this lease is issued the department will consider cancellation of the lease for failure to drill an offset well. | | X |
| Prior to the cutting or removal of timber on these tracts for exploration or development related activities, the lessee shall acquire the approval of the appropriate TLMD area office. | | X |
| To protect wildlife during periods important to their survival, surface occupancy or other activity shall be restricted from (date) through (date) of each year unless otherwise authorized in writing by the TLMD. Dates are determined on a case-by-case basis depending on the applicable species. | | X |
| Potential wildlife conflicts have been identified for this tract. The TLMD will contact the Montana Department of Fish, Wildlife, and Parks office in the area for advice on alleviating any possible conflicts caused by lessee's proposed activities. Additional mitigation measures may be required. | | X |

## TABLE MIN-5
## MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

| Mitigation Measure | BLM | TLMD |
|---|---|---|
| Potential wildlife conflicts have been identified for this tract. The TLMD will contact the U.S. Fish and Wildlife Service office in the area for advice on alleviating any possible conflicts caused by lessee's proposed activities. Additional mitigation measures may be required. | | X |
| Wildlife species of concern have been identified on or near this tract. A survey in areas of proposed activity may be required prior to disturbance. Identified species will be avoided, unless otherwise authorized by the TLMD. Additional mitigation measures may also be required. | | X |
| Any activity within 1/8 mile of the river, flood plain, or lake/reservoir on or adjacent to this tract must be approved in writing by the TLMD prior to commencement. No surface occupancy is allowed within the bed of the river, abandoned channels, the bed of the lake/reservoir, or on islands and accretions associated with the river or lake/reservoir. | | X |
| No activity shall be allowed within 100 feet of any perennial or seasonal stream, pond, lake, prairie pothole, wetland, spring, reservoir, well, aqueduct, irrigation ditch, canal, or related facilities without prior approval of the TLMD. | | X |
| Due to unstable soil conditions on this tract and/or steep topography, surface use may be restricted or denied. Seismic activity may be restricted to poltershots. | | X |
| Due to existing surface uses (such as center pivots, wheel lines, etc.) development on this tract may be restricted. | | X |
| Plant species of concern have been identified on or near this tract. A vegetation survey in areas of proposed activity will be required prior to disturbance. Identified rare plant species will be avoided, unless otherwise authorized by the TLMD. | | X |
| A critical weed problem exists on this tract. Additional mitigation measures will be required to prevent further spread of noxious weeds. The department may require such measures as power washing of vehicles, car pooling, timing restrictions for seismic, etc. to facilitate this prevention. | | X |
| This tract contains biological weed-control sites which must be avoided unless otherwise authorized by TLMD. | | X |
| No surface occupancy of the cemetery site is permitted without written approval of TLMD. | | X |
| Wooded areas on this tract will be avoided unless otherwise authorized by the TLMD. | | X |

# MONITORING APPENDIX

# MONITORING APPENDIX

## Introduction

For each resource, a series of items will be monitored. Each item is evaluated by location, technique for data gathering, unit of measure, and frequency and duration of data gathering. When a duration is not specified, the duration is for the next 20 years. The monitoring plan states the event that will be evaluated and lists the key resources that will be monitored. If an adverse impact can be corrected by a management action within the scope of this plan, the change will be implemented. If the adverse impact can be corrected only by a management action that is outside the scope of this plan the Billings or Powder River Resource Management Plans (RMPs), the management change will be a formal amendment.

The Department of Natural Resources and Conservation (DNRC) Technical Advisory Committee (TAC) for the Powder River Basin Controlled Groundwater Area has proposed a groundwater monitoring plan for coal bed methane (CBM) development. The monitoring recommendations are incorporated into the monitoring table. A complete copy of that plan is at the end of this appendix.

The Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), and the State of Montana (state) have developed a wildlife monitoring and protection plan. It is located as an attachment to the Wildlife Appendix.

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| **AIR QUALITY** | Gaseous and particulate critical air pollutants | area-wide | air quality modeling and ambient air samples | $\mu g/m^3$ and parts per million concentrations as ($\mu g/m^3$) | hourly to 24 hr samples as per standards | predicted or measured exceedances of NAAQS and/or PSD increments by MDEQ | implement additional emission controls or operating limits |
| | Gaseous and particulate critical air pollutants | Birney/Ashland area | ambient air samples | $\mu g/m^3$ and parts per million concentrations as ($\mu g/m^3$) | hourly to 24 hr samples as per standards | before expanded development activity | implement additional emission controls or operating limits |
| | Gaseous and particulate critical air pollutants | area-wide | emission inventory | lbs/hr and tons/yr | annually | continuous | require submittal of annual reports |
| **CLIMATE** | | areas affected by land disturbance | RAWS or COOP Stations | bulk precipitation | daily during the growing season | extremes affecting revegetation operations | |
| **CULTURAL RESOURCES** | Area of Critical Environmental Concern (ACECs) | area-wide | site inspection | site, surrounding area | annually | any noticeable trend indicating increased disturbance—natural or human-caused | increase frequency of monitoring to ensure ACEC values are not being impaired |
| | 20% of National Register eligible sites | CBM emphasis area | site inspection | site, surrounding area | annually | impacts to sites from unauthorized uses affecting qualities that make sites eligible for listing on National Register of Historic Places | halt activity affecting eligible sites. Increase monitoring of nearby eligible sites. Evaluate damage to sites. |
| | random sample of 50 sites | CBM emphasis area | site inspection | site, surrounding area | annually | any noticeable trend indicating increased disturbance—natural or human-caused | increase frequency and number of sites monitored, if sites are being impacted by CBM-related activities. Evaluate damage to sites. |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| **HYDROLOGY** | surface water quality and quantity | area-wide on major rivers or streams where management activities are occurring or expected to occur | standard USGS quantitative measurements of water quality, including but not limited to pH, electric conductivity (EC), water temperature, common ions (Na, Mg, Ca, K, $HCO_3$, CI, $SO_4$), and discharge | standard quantitative measurements of water quality and quantity (i.e., mg/l, °C, µS/cm, cfs) | discharge measurements to be taken daily at designated U.S. Geological Survey locations, including but not limited to the Tongue River at the state line (Decker), Tongue River at Brandenburg bridge (Ashland), Powder River at the state line (Moorhead), and Powder River above Locate. Stream water quality samples will be taken monthly at these stations. This sampling frequency will continue until CBM production ceases. | exceedance of any parameter above the state of MT surface water quality standards, including sodium absorption ratio (SAR), ED, or suspended sediments | report exceedance to MDEQ, who will determine if exceedance is because of natural (low flow) or human causes. If caused by CBM discharge, enforcement action will be taken and/or Montana Pollutant Discharge Elimination System permits modified. |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| | groundwater quality and quantity | regional coal seam monitoring wells will be installed on sites 3 to 5 miles from outcrop lines. Monitoring wells also will be required on sites where activities are occurring or expected to occur. Abandoned exploration and CBM wells will be converted to monitoring wells as needed. | coal seam monitoring wells would be finished in coal seams expected to be developed for CBM. Standard USGS quantitative measurements of water quality and quantity would be used, including but not limited to pH, EC, water temperature, common ions (Na, Mg, Ca, K, $HCO_3$, CI, $SO_4$), and depth to water. | standard quantitative measurements of water quality and static water level (mg/l, °C, μS/cm, and feet to water, reported in hundredths of feet) | depth to water measurements will be made monthly for the first 3 years to establish baseline. Measurements will be made quarterly thereafter, unless a greater frequency is determined to be necessary. Water quality samples will be taken quarterly for the first 3 years to establish baseline and annually thereafter, unless a greater frequency is determined to be necessary. Monitoring will continue until at least 95% recovery of static water level has been achieved, or the end of CBM development, whichever is longer.; | a 5-foot decrease in static water level from seasonally adjusted mean static water level (determined during the first 3 years), or a significant shift in water quality from baseline conditions (determined from first 3 years of data) that impacts its beneficial use | if falling water levels are determined to be caused by CBM activity, operators must offer water well mitigation agreements to all landowners with wells in defined drawdown area (5 feet or greater drawdown) of their development. Hydrologic barriers, such as injection wells, may be an option in some cases to prevent drainage of Native American gas and water resources. |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
|  | groundwater quality and quantity | alluvial groundwater would be monitored in stream valleys topographically down gradient from CBM surface discharge points | monitoring wells would be finished in the alluvium. Depth to water measurements and water quality parameters, including but not limited to pH, EC, water temperature, common ions (Na, Mg, Ca, K, $HCO_3$, CI, $SO_4$), and would be obtained. | standard quantitative measurements of water quality and static water level (mg/l, °C, μS/cm, and feet to water, reported in hundredths of feet) | depth to water measurements will be made monthly. Water quality samples will be taken quarterly. Monitoring will continue until at least 95% recovery of static water level has been achieved, or the end of CBM development in that drainage, whichever is longer. | if static groundwater levels are naturally greater than 10 feet below ground surface, a rise in static groundwater levels to 10 feet below ground surface will be the trigger. If natural static groundwater levels are between 10 and 5 feet of the surface, a 2-foot rise in water levels from seasonal baseline levels (determined from the first year of data) will be the trigger. If static groundwater levels are naturally within 5 feet of the surface, a 1-foot rise in water levels from seasonal baseline levels (determined from the first year of data) will be the trigger. A change in groundwater chemistry such that beneficial use of groundwater would be impacted, also will serve as a trigger. | if rises in groundwater levels are determined to result from CBM development, direct discharge of CBM water into waterways in watershed would cease until modified Water Management Plans (WMPs) are submitted and approved |
|  | groundwater quality and quantity | monitoring wells will be installed approximately 300 feet topographically downgradient from infiltration and evaporation impoundments | a nest of monitory wells will be installed with completions just above each aquatard, up to 100 feet total depth, to determine effectiveness of infiltration or if evaporation basins are leaking | depth to water (feet to water reported in hundredths of feet). Water quality samples may be collected as needed. | wells will be gauged monthly. Monitoring will continue at least 95% recovery of static water level has been achieved, or the end of CBM water discharge into the associated basins, whichever is longer. | a rise of 1-foot or more in static water levels above seasonally adjusted mean water levels (determined from the first year of data) | if the rise in water levels is determined to result from CBM activities, operators may be required to install additional monitoring wells further downgradient, or discharge into impoundments may be required to cease until a revised WMP is submitted and approved |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| | springs | a network of springs will be identified along coal outcrops in the CBM development area | spring discharge and water quality parameters, including but not limited to pH, EC, water temperature, common ions (Na, Mg, Ca, K, $HCO_3$, CI, $SO_4$), will be determined from existing springs | discharge (cfs), pH, EC (µS/cm), and water temperature (°C) will be determined in the field. Standard quantitative measurements of water quality also will be used (mg/l) | discharge, pH, EC, and water temperature will be determined quarterly. Water samples will be collected for analysis annually. | a 50% decrease in spring discharge below seasonally adjusted mean (determined in the first 3 years), or a significant change in water quality that affects its beneficial use, or a change in the spring ecosystem from functional to nonfunctional | if decreased spring discharges or water quality are determined to result from CBM activity, operators must offer spring mitigation agreements to landowners who use the spring. If impacted spring is identified as important wildlife habitat, adaptive management practices will be used at the landscape level to improve spring ecosystems. Hydrologic barriers, such as injection wells, may be an option in some cases to prevent drainage of Native American gas and water resources. |
| **INDIAN TRUST** | groundwater | adjacent to the Northern Cheyenne and Crow reservations | sampling of dedicated monitoring wells in the zones of extraction and zones above and below the expected activity—wells are to be placed in the affected areas to areas unaffected by management activities | standard quantitative measurements of water quality—measurement of depth in feet | field measurements 6 times yearly prior to production activities, continue throughout the activity period and for the duration of 95% of the recovery of pre-development conditions | where site-specific studies show a potential to affect Reservation groundwater, the Tribe would be consulted as to appropriate protection measures and if continuous monitoring shows a drawdown of groundwater that is attributed to CBM production | BLM would require the operators to modify federal CBM production. Mitigation options include reducing production rates, shutting in the well or wells, establishing a hydrologic barrier, or providing compensation to the affected Tribe. |
| | | | monitoring wells will be established near the mouth of streams that contain alluvium | measurements of depth in feet | water level measurements will be taken monthly prior to production activity and during the development - water quality measurements will be taken 4 times per year | a 20% rise in the water table above its seasonally adjusted elevation, or a 2 unit increase in the SAR value | Discontinuance of CBM evaporative ponds in that watershed, or require ponds to be lined |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| | natural gas | area-wide | drainage evaluation | radius of drainage | as needed | gas drainage | a communitization agreement, requiring operators to reduce production rates, shut-in wells, change spacing, or establish a hydrologic barrier to protect the Indian minerals from drainage |
| **LANDS AND REALTY** | rights-of-way | area-wide | site inspection | right-of-way | minimum of once during or for construction within 2 years of issuance for MLA reviews and within 5 years of issuance for FLMPA reviews; then in the 20th year after issuance and every 10 years thereafter | nonuse of right-of-way or violation of right-of-way grant stipulations | require compliance with right-of-way grant stipulations with possible suspension and/or termination for noncompliance or nonuse |
| **MINERALS**<br>**Oil and Gas** | Geophysical Notice of Intent (NOI) | area-wide | line or area inspection | operations conducted in compliance with NOI | minimum of once during operations | violation of regulations, change from approved Notice of Intent, unnecessary or undue degradation | require operator to follow NOI |
| | Geophysical Notice of Completion (NOC) | area-wide | line or area inspection | operations conducted in compliance with NOC | minimum of once during plugging, once after reclamation | violation of regulations, change from approved NOC unnecessary or undue degradation | require operator to correct violation |
| | Application for Permit to Drill (APD) | area-wide | site inspection | operations conducted in compliance with Application for Permit to Drill | minimum of once and as necessary | violation of regulations, change from approved Application for Permit to Drill | issue an incidence of noncompliance (INC) with timeframe to correct or shut-in drilling operations |
| | Sundry Notice | area-wide | site inspection | operations conducted in compliance with Sundry Notice | as necessary | violation of regulations, change from approved Sundry Notice unnecessary or undue degradation | issue an INC with timeframe to correct |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| | natural gas | area-wide | drainage evaluation | radius of drainage | as needed | if gas drainage is occurring, there would be a communitization agreement, drilling of protective wells on federal lands, or different spacing, to protect the federal minerals from drainage | certified letter to lessee requiring protection, compensation royalty, relinquishment |
| | produced water disposal | area-wide | site inspection | operations conducted in compliance with permit | minimum of once annually or as necessary | violation of regulations, change from approved permit, unnecessary or undue degradation | issue an INC with timeframe to correct or shut-in operations |
| | spill | area-wide | site inspection | area cleaned up, reclaimed | minimum of once after event and as necessary | violation of regulations, change from approved permit, unnecessary or undue degradation | issue an INC and operator cleanup required |
| | plugged, abandoned wells | area-wide | site inspection | operations conducted in compliance with permit | minimum of once during operations | violation of regulations, change from approved permit, unnecessary or undue degradation | issue an INC correction required |
| | abandoned well reclamation | area-wide | site inspection | operations conducted in compliance with permit | minimum of once and as necessary until reclamation complete | violation of regulations, change from approved permit, unnecessary or undue degradation | issue an INC/certified letter requiring proper operator rehabilitation |
| **PALEONTOLOGY** | significant paleontological localities, ACECs | area-wide | inspection of area disturbed | degradation caused by human or natural activities that lead to loss of significant fossil resources | once yearly | loss or damage to significant fossil resources | closure of areas surrounding site to prevent further disturbance to significant fossil resources |
| **RECREATION** | general recreation use | area-wide with emphasis on dispersed use of undeveloped recreation sites | area inspections to look for vandalism, resource abuse, and install photo points | site condition | biannual (June and October); photograph annually | user conflicts, resource degradation, or safety hazards | avoid location of oil and gas facilities in undeveloped recreation sites having concentrated use, and coordinate timing of exploration activities to minimize conflicts during peak periods of use |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| | concentrated recreation use | special recreation management areas, sites with recreation facilities | visitor registration, traffic counters estimates, photo points | visitor days, site condition | visitor registration boxes, counters checked once monthly at the minimum, weekly or biweekly during heavy use periods, photograph annually | increased visitor use per year or sustained use that requires additional or improved facilities | avoid location of oil and gas facilities in developed recreation sites having concentrated use, and coordinate timing of exploration activities to minimize conflicts during periods of use |
| | | area-wide commercial, competitive activities | administrative review, site inspection for complexes with permit stipulations | permit stipulations, resource condition success of reclamation | on site during competitive events, periodic site inspection for commercial operations, administrative review annually | irreparable resource damage, compromise of visitor safety, recreation experience | avoid location of oil and gas facilities in areas where know commercially permitted recreation activities are occurring and coordinate timing of exploration activities to minimize conflicts during peak periods of use |
| **SOILS** | soil erosion, uplands | area-wide where management activities are occurring or expected to occur | visual observation and surveyed erosion pins | soil loss in tons per acre | site will be visually examined quarterly. Where erosion is deemed excessive, measurements of site characteristics will be taken to determine rate of soil loss. | visual evidence of rill, gully, or sheet erosion. Loss of soil exceeding 10 tons per acre | report exceedance to BLM, MDEQ, or EPA. If caused by CBM discharge or activities, enforcement action will be taken. |
| | soil erosion, streambank, and floodplain | area-wide along rivers and tributaries where management activities are occurring or expected to occur | visual observation and surveyed erosion pins | area effected in square feet or acres | site will be visually examined quarterly. Where streambank erosion is deemed excessive, measurements of site characteristics will be taken to determine soil loss. | a 10% increase in streambank loss | report exceedance to BLM, MDEQ, or EPA. If caused by CBM discharge or activities, enforcement action will be taken. |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| | soil salinization | area-wide where management activities are occurring or expected to occur | visual observation, measurement of soil characteristics such as pH, EC, SAR | area effected in square feet or acres | site will be visually examined quarterly. Where salinity levels show an increase because of vegetation or soil effects, measurements of site characteristics will be taken to determine salinity levels. | a 20% increase in conductivity levels | report exceedance to BLM, MDEQ, or EPA. If caused by CBM discharge or activities, enforcement action will be taken. |
| | compaction | areas effected by extraction activities | penetrometer or visual inspection | pounds per square inch | 1 to 2 times yearly | 10% increase in density | limit or block access to compacted sites |
| **VEGETATION** | | | | | | | |
| | ecological status | areas affected by disturbance through the pre-production, production, post-production processes | ecological site method in key areas | composition, production compared to potential natural community for each site | pre-development ecological status baseline data | status is reduced by 15% or a drop in class | ecological site integrity will be altered to increase status of ecological site index by 15% or an increase in ecological class |
| | trend | areas affected by disturbance through the pre-production, production, post-production processes | any suitable methods as described in TR 4400-4 or the National Range Handbook | apply to the technique selected, may include number of individuals per unit area, percent cover, percent frequency, or percent species composition | every 3 to 5 years after the collection of ecological status baseline data | a change in the direction of trend away from management | measure implementation of action put forth to mitigate reduction of ecological status using techniques listed in monitoring appendix for vegetative trend |
| **Noxious Weeds** | trend | areas affected by disturbance through the pre-production, production, post-production processes | Montana Noxious Weed Standards | acres, plants per square feet, species | yearly (through post production reclamation) | 10% increase beyond objectives for the area/new species occurrence or infestation | operators will be required to contain and suppress noxious weeds. Conservation measures will be required in noxious weed sites to decrease population of noxious weeds and increase population of native plant community |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| **Riparian/ Wetlands** | condition, trend, age class structure, streambank alteration | any federal action (including split estate) | photo plot, estimate key areas by sight inspection, Cole Browse Method, Key Forage Method, other methods found in Technical References (TR4400-3, TR4400-4, TR4400-7, TR1737-3, TR1737-8, TR1737-9) including MRWA (Montana Riparian Wetland Association) Riparian Inventory for areas not previously inventoried MRWA PFC on inventory areas | percent species composition, percent in each age class, percent utilization, height, percent of the streambank | based on activity plan schedule- a minimum of once every 5 years | trend away from objective or when no improvement occurs, in unsatisfactory habitat condition/functioning at risk with downward trend | oil and gas operators will be required to alter activities in order to provide environmental factors for increasing functionality or habitat conditions of the streams/wetlands. Oil and gas operators may be required to develop replacement wetlands in order to compensate for overall loss of wetlands according to Section 404 of Clean Water Act. |
| **Special Status and Threatened and Endangered (T&E) Plant Species** | condition | areas affected by disturbance through the pre-production, production, post-production processes | Montana Natural Heritage Program and visual inspection | presence and condition | once during the growing season, at a minimum | downward trend in plant condition caused by oil and gas activities | oil and gas operators will be required to alter their activities in order to benefit environmental factors required by special status or T&E plant species |
| **WILDLIFE (see also "Wildlife Outline" following the Table)** | | | | | | | |
| **Aquatic Biological Diversity (flora/fauna)** | population diversity | intermittent/perennial streams associated with produced water discharge | stream sampling | diversity index | every 3 years | downward trend overall stream biological diversity | reduction or elimination of untreated produced water into drainage or watershed |
| **Big Game** | seasonal habitat use | project area plus 1-mile buffer | air/ground field inspection | occupancy | annually | downward trend in habitat occupancy | extension of timing stipulations or conditions of approval, off-site habitat management or enhancement |
| **Black-footed Ferret** | occupancy | prairie dog towns larger than 80 acres located within 0.5 mile of proposed activity | ground inspection | occupancy | determined on a site-specific basis in coordination with U.S. Fish and Wildlife Service (FWS) | habitat decline or prairie dog fatalities caused by oil and gas activities - occupancy of black-footed ferrets would be managed in a Black-Footed Ferret Management Plan | no incidental take; reinitiate consultation if new information shows it may be effected |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| **Burrowing Owl** | active nest locations | specific project area plus 0.5-mile buffer (within active prairie dog town) | ground inspection | occupancy | twice yearly (June to August) | human-caused disturbance to owls related to oil and gas activities such as vandalism and harassment | extension of timing and/or increase of distance from nest; stipulations or conditions of approval |
| **Grey Wolf** | occupancy | Billings RMP area | air/ground field surveys | number of sitings | annually until reintroduction objectives are met | 1- to 3-year downward trend in production or occupancy | no incidental take; reinitiate consultation if new information shows it may be effected |
| **Migratory Non-game Birds** | occupancy | project area plus 0.25-mile buffer | ground observations | occupancy | periodically | documented fatalities caused by oil and gas activities | refinements in infrastructure planning (project plans), implementation of travel corridors, enhanced reclamation standards, and off-site habitat management or enhancement |
| **Mountain Plover** | active nest locations | specific project area plus 0.5-mile buffer (within areas less than 4-inch average vegetation height and prairie dog towns) | ground inspection | occupancy | twice yearly (April 15 to June 30) | human-caused disturbance to mountain plovers related to oil and gas activities such as vandalism and harassment | BLM received an exemption from the prohibitions of Section 9 of ESA regarding take by agreeing to terms and conditions in biological opinion (BO). Incidental take of habitat and individuals allowed up to level stated in BO. Take must be monitored. Reinitiation of Section 7 will occur before allowable take is exceeded. |
| **Prairie Dog** | active prairie dog colony | specific project area plus 0.5-mile buffer | air/ground inspection | occupancy | annually | documented prairie dog fatalities caused by oil and gas activities | establishment of no surface occupancy zones and/or establishment of timing restrictions within prairie dog towns |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| **Raptors** | active nest locations (excluding burrowing owls) | project area plus 1-mile buffer | air/ground field inspection | number of nests | every 3 years | downward trend in occupancy | extension of timing and/or increase in distance from nest; stipulations or conditions of approval |
| | raptor productivity (including Burrowing owl) | active nests within 1-mile of project disturbance plus 1-mile buffer | air/ground field inspection | nest success/failure species productivity | annually | downward trend in nest success, overall productivity | extension of timing and/or increase in distance from nest; stipulations or conditions of approval |
| | raptor productivity-selected undeveloped comparison area | project area | air/ground field inspection | nest success/failure species productivity | every 5 years | information used as support to determine downward trend | extension of timing and/or increase in distance from nest; stipulations or conditions of approval |
| **Sage Grouse** | sage grouse<br>lek location | CBM overall project area | aerial field inspection | number, location of leks | every 5 years | downward trend in habitat occupancy | extension of timing and/or increase in distance from lek; stipulations or conditions of approval; off-site habitat management/mitigation |
| | sage grouse<br>lek attendance | specific project development areas plus 2-mile buffer | air/ground field inspection | number of males/lek | annually | downward trend in lek attendance | extension of timing and/or increase in distance from lek; stipulations or conditions of approval; off-site habitat management/mitigation |
| | sage grouse<br>winter habitat | project area plus 2 mi. buffer | air/ground field inspection | occupancy | annually | downward trend in habitat occupancy or quality caused by oil and gas activities | extension of timing and/or increase in distance from lek; stipulations or conditions of approval; off-site habitat management/mitigation |
| **Special Status Species (BLM and Montana Natural Heritage Program lists)** | occupancy | specific project area plus 1-mile buffer | ground field inspection | occupancy | annually at a minimum via species habitat requirements | downward trend in habitat occupancy or quality caused by oil and gas activities | establishment of timing and/or distance from breeding area through stipulations or conditions or approval |

| Element | Item | Location | Technique | Unit of Measure | Frequency and Duration | Remedial Action Trigger | Management Options |
|---|---|---|---|---|---|---|---|
| **Threatened, Endangered and Proposed Species other than previously described** | occupancy, productivity | CBM overall project area | air/ground field inspection | occupancy | determined on a site-specific basis in coordination with FWS | habitat decline or fatalities caused by oil and gas activities; occupancy of species would be managed in a site-specific Management Plan | reinitiate section and consultation with FWS |

# REGIONAL-SCALE MONITORING OF POTENTIAL EFFECTS OF COAL BED METHANE DEVELOPMENT ON WATER RESOURCES

**Prepared by the Technical Advisory Committee for the Powder River Basin Controlled Groundwater Area**

## Introduction

Coal bed methane (CBM) is released from coal seams by pumping groundwater from coal seams to lower ground water pressures. The coal seams targeted for CBM development in the Powder River Basin constitute important regional aquifers that provide water for domestic, livestock, agricultural, and industrial uses. Consequently, CBM production will probably affect existing water uses in the Powder River Basin, although the extent and magnitude of effects are difficult to predict.

The Montana Board of Oil and Gas Conservation (MBOGC) requires, through its Order No. 99-99, that CBM producers submit field development plans that include groundwater characterization and monitoring. In addition to complying with existing MBOGC rules for wildcat gas wells, CBM producers are required to describe baseline hydrologic conditions, to inventory existing wells and springs, to offer water mitigation agreements to existing water users, and to monitor water production and shut-in water pressures within coal bed methane fields. Water mitigation agreements must be offered for a minimum of one-half mile (expanded to one mile in Mont. Code Ann. 85-2-521) from CBM fields or greater distances if effects extend father. The U.S. Environmental Protection Agency (EPA) requires monitoring under permits for Class V injection wells used to re-inject water produced during CBM production. Specific requirements of Class V injection permits may include monitoring of injection pressure, injection rate and total volume at injection wells, and ground water elevations in monitoring wells.

There are no clear regulatory requirements for monitoring effects to ground water levels or spring flows outside the one-mile minimum specified by MBOGC or the area affected by Class V injection wells. Groundwater monitoring conducted by CBM producers within and near CBM fields, as required by MBOGC or the U.S. EPA, will not reveal broad regional effects. Therefore, regional-scale monitoring needs to be conducted outside areas of potential CBM development to allow potential effects to be evaluated before, during, and after the period of CBM production. In addition, the spacing of monitoring sites and the frequency of monitoring needs to be sufficient to distinguish potential effects attributed to CBM development from potential effects attributed to other water users, and from ambient/seasonal variations in ground water levels and spring flows.

The purpose of this document is to establish design criteria for a regional-scale monitoring program intended to detect potential effects of CBM development on existing water uses. The objectives of the regional scale monitoring program are to characterize baseline hydrologic conditions, detect changes in ground water levels and flows from springs attributable to CBM development, and verify recovery of ground water levels after CBM development ends. Regional-scale monitoring of wells and springs is intended to augment and compliment field-scale monitoring established under MBOGC Order No. 99-99 or EPA UIC Class V injection well permits.

Criteria for selecting locations and spacing for monitoring sites, consisting of wells and springs, and monitoring practices are proposed here to ensure that long-term monitoring is sufficiently comprehensive to detect effects that CBM development might have on ground-water systems. Priorities are proposed to coordinate monitoring with the pace of development and the need to evaluate potential effects, and recommendations are presented for implementing monitoring and managing monitoring data. The criteria and monitoring recommendations described below are not meant as rigid rules, but rather are intended to guide qualified personnel in selecting monitoring locations and implementing monitoring that meet the objectives stated above.

The BLM, at its discretion, will administer the regional-scale monitoring program, while operators will be responsible for all in-field monitoring. The BLM has a commitment to maintaining the water monitoring of the PRB region, similar to their continued (25+ years) funding of the MBMG for coal mine water monitoring. The BLM will also partner with operators for in-field monitoring when federal gas is produced.

# Criteria and Monitoring Practices

The portion of the Powder River Basin underlain by coals of the Tongue River Member of the Fort Union Formation is generally considered to have potential for CBM development. Within this area, however, CBM is less likely to be developed from coal seams with limited thickness and ambient ground water pressures; conditions that indicate limited potential for gas production. These areas, located primarily within 2 to 5 miles of coal outcrops, should be targeted for monitoring wells.

The Anderson-Dietz, Canyon, Wall, and Knobloch are the four primary coal seams within the Tongue River Member (Map 1). Separate monitoring sites located within 5 miles of the outcrops of each of these coal zones are proposed. Clusters of wells will be completed in different coal zones where outcrop areas overlap and, where present, springs will be monitored near each monitoring site. Monitoring wells will need to be completed in alluvial aquifers, in areas where water from CBM production is discharged to surface impoundments, or in selected sandstone aquifers within coal outcrop areas or CBM fields (when not required by MBOGC or the U.S. EPA). Springs that are current, historical, or potential sources of water but located away from established monitoring sites may also be monitored.

The focus of overall monitoring of the potential effects of CBM development will change as CBM fields mature, and gas production declines and eventually ends. Monitoring performed by CBM operators that is required by MBOGC or the U.S. EPA, will gradually be discontinued as portions and eventually all of fields are played out. Abandoned producing wells or monitoring wells within CBM fields should be incorporated into the regional monitoring program as field mature, in order to effectively monitor post-production groundwater recovery in affected areas.

The need for detailed information, and the cost of installing monitoring wells and monitoring ground water-levels and spring flows, will need to be balanced to determine the ultimate spacing between monitoring sites. At a minimum, one monitoring site will be located in every township that lies within 5 miles of the outcrop of a targeted coal. The ultimate spacing of monitoring sites might be greater, depending on site-specific conditions such as thickness of coal zone and importance of coal or sandstone aquifers, and priorities for monitoring outlined below.

Monitoring wells may be newly constructed wells, existing monitoring or water supply wells, or abandoned or transferred CBM production wells. Ground-water levels in monitoring wells and flows of springs will need to be measured monthly to obtain a sufficient data record to characterize patterns of seasonal changes in ground-water level or spring flows, before the wells or springs can be effected by CBM development. Typically two to three years of monitoring record is desirable. Monitoring frequency should be reduced once a sufficient record of baseline conditions is established.

# Priorities

The following priorities are proposed for initiating monitoring and selecting monitoring well density and frequency, to ensure that a regional ground water monitoring program is established in advance of anticipated CBM development and before potential effects of CBM development can occur.

- *Sequence of CBM development*—Areas most likely to be affected by CBM development first are the highest priority for initiating monitoring. CBM development is expected to focus initially on the Anderson-Dietz coal zone and, therefore, monitoring near its outcrop should begin first. Records of exploration wells, pipeline plans, and identification of prospective coal zones can provide more specific information regarding the sequence of CBM development.
- *Extent of water use*—Areas where water from coal-beds is heavily used are high priorities for monitoring. Within the general area of the Anderson-Dietz outcrop, areas of concentrated water use, such as the headwaters of Otter Creek, will need immediate and more intensive monitoring.
- *Proximity to political boundaries*—Monitoring should be established along political boundaries, specifically the Montana-Wyoming border and reservation boundaries, in order to detect potential effects from areas outside the regional monitoring network.
- *Sensitivity or hydrogeologic setting*—More intensive monitoring will be necessary where faulting or complex stratigraphy result in complex hydrogeologic settings.
- *Existing monitoring networks*—Monitoring should be re-established at monitoring wells near operating coal mines and coal mining prospects

studied in the past. New monitoring well construction should focus on areas where wells are not available.

- *Land or mineral ownership*—Monitoring should be conducted at sites with stable land and/or mineral ownership. For example, federally owned land, or other land with long-term access easements provide more reliable long-term access for monitoring.

## Implementation and Data Management

An important goal of the proposed regional monitoring program is to ensure that all monitoring data collected are made readily accessible to the public. The regional monitoring program can, and probably will, be conducted by more than one agency, with funding from various sources. However, one agency or interagency will need to coordinate or review all regional monitoring activities in order to assure that monitoring occurs where needed and to prevent duplication. Data from field-scale monitoring pursuant to MBOGC Order 99-99 and EPA UIC Class V injection well permits will need to be managed similarly. A further responsibility of the lead agency or group should be to ensure that regional- and field-scale monitoring data are compiled and made available to the public in the Ground-Water Information Center (GWIC) and the National Resource Information Systems (NRIS).

## Summary of Recommendations

A regional-scale monitoring program is necessary to characterize baseline hydrologic conditions, to detect potential effects resulting from CBM development, and to verify recovery of ground water levels after the period of CBM development. The following constitutes the main elements of a regional-scale monitoring program that should accomplish these objectives:

- Monitoring is needed to augment and compliment field-scale monitoring established under MBOGC Order No. 99-99 and EPA UIC Class V injection permits.
- Groundwater levels need to be measured in wells in coals and overlying or underlying sandstone aquifers at locations near coal outcrops outside of areas of prospective CBM development.
- Groundwater levels need to be measured in wells in alluvial aquifers in areas where water CBM production is discharged to surface impoundments, or selected sandstone aquifers within CBM fields.
- Flows from springs need to be monitored when they are near well monitoring sites or if they are important water sources.
- Groundwater levels need to be measured in abandoned or transferred CBM wells as CBM fields mature.
- Monitoring sites need to be located in every township near coal outcrops at a minimum.
- Groundwater levels in wells and flows from springs need to be measured monthly to characterize ambient seasonal patterns.
- Monitoring sites need to be established to ensure that the regional monitoring program is implemented in advance of localized CBM development and, consequently, that potential effects can be detected.
- One oversight agency or interagency group responsible for collecting and compiling comprehensive and consistent data should implement the proposed regional monitoring program.
- Monitoring data need to be compiled and made available to the public through GWIC and NRIS.

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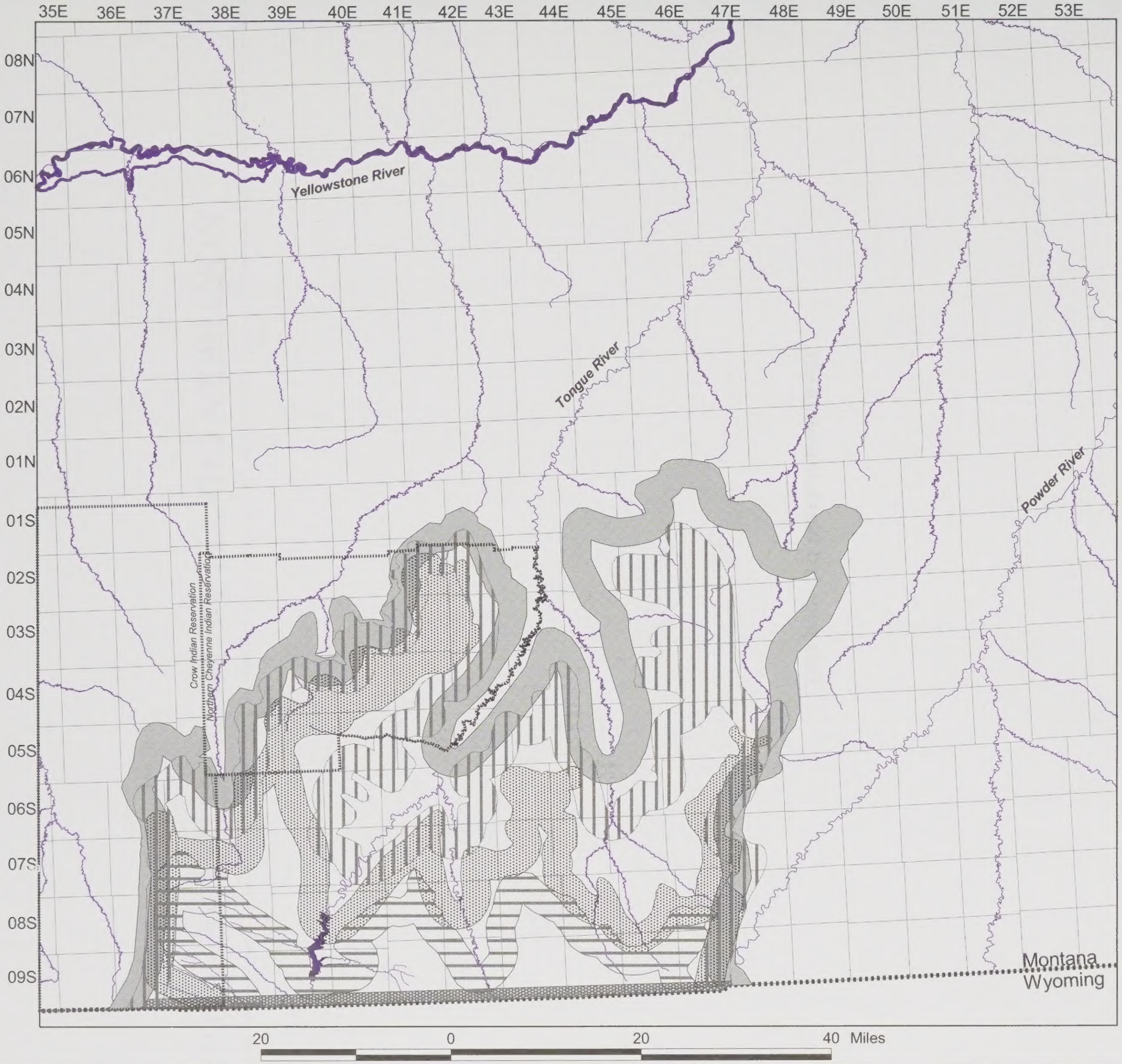
# Monitoring Appendix
# Map 1.
## Conceptual map showing recommended areas for a regional-scale coal-bed methane monitoring program

Montana Department of Natural Resources
Technical Advisory Committee for the Powder River
Basin Controlled Ground-Water Area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Yellowstone River
Tongue River
Powder River
Crow Indian Reservation
Northern Cheyenne Indian Reservation
Montana
Wyoming
20
0
20
40 Miles

Legend

- ▤ Anderson
- ░ Canyon
- ▥ Wall
- ▒ Knobloch
- ▓ State-line monitoring area

This map is part of a report prepared by the Montana Department of Natural Resources, Technical Advisory Committee for the Powder River Basin controlled ground-water area, titled: Regional-scale monitoring of potential effects of coal bed methane development on water resources. The Technical Advisory Committee proposes a minimum of 1 monitoring site in each township within three - five miles of coal outcrops. In addition, monitoring is proposed near the Montana-Wyoming border.

The Anderson, Canyon, Wall and Knobloch coal seams are the four primary seams within the Tongue River Member of the Fort Union Formation in the Montana portion of the Powder River Basin. Shaded zones represent areas that are generally 3 miles or less from these respective coal outcrops. Separate ground-water monitoring sites are proposed within each of these coal zones to study the potential effects of coal-bed methane development. Actual site locations will be based on detailed geology and field conditions.

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# NORTHERN CHEYENNE MITIGATION APPENDIX

# NORTHERN CHEYENNE MITIGATION APPENDIX

BLM meets its trust responsibility to protect American Indian trust resources and assets (trust resources) by first considering the potential impact of the proposed activity on identified trust resources. BLM then consults with the appropriate tribal government to obtain their comments on potential impacts to trust resources, along with possible protective measures. BLM considers the tribal government's comments and then determines what measures would be required to protect trust resources. BLM's decision has to consider, but not necessarily defer to, the comments of the tribal government on measures adequate to protect trust resources.

The left hand column of the following table contains mitigating measures for coal bed methane (CBM) development that were proposed by the Northern Cheyenne Tribe in a letter to BLM dated August 13, 2002. A copy of the complete letter is available from the BLM. The column on the right contains the measures BLM would use to protect tribal trust resources, or to protect other area resource values of importance to the Tribe. These mitigating measures are part of Alternative E, the preferred alternative, and would be imposed on operators at the APD approval stage of development as needed on a case-by-case basis; or followed by BLM on a programmatic basis. The mitigation measures would only be applied on those lands/minerals where BLM has the authority. Some of the Tribe's mitigating measures do not have corresponding mitigation proposed by BLM due to limits in BLM authorities. Such instances are noted in the table and remain as mitigation options that may be undertaken by other agencies involved in the permitting process.

| Northern Cheyenne Tribe—Proposed Mitigation | BLM Mitigation Measures Under Alternative E |
|---|---|
| ***Part I, Natural Resources:***<br>**A. Protection of Reservation Groundwater** | |
| 1. *Buffer Zone.* An initial buffer zone of 14 miles will be maintained around the Northern Cheyenne Reservation exterior boundaries. This is the minimum necessary to assure that Reservation groundwaters are not adversely affected by off-Reservation CBM development. | If proposed development of CBM resources is located in aquifers with hydrologic connectivity to groundwater resources of the Northern Cheyenne Reservation, the following measures would be required:<br>The operator[1] would be required to determine the potential for proposed field development[2] to affect Reservation groundwater when CBM production is proposed.<br>The 14-mile buffer zone proposed by the Northern Cheyenne Tribe would not be applied. This buffer zone is based on a theoretical maximum drawdown radius assuming uniform geologic and hydrologic conditions in a 2D model. Groundwater modeling that accounts for geologic faults, irregularities, and vertical leakage was prepared for the Final EIS. The modeling predicts a drawdown radius of 4 to 5 miles (in the Hanging Woman Creek drainage). These results more accurately represent anticipated site conditions and are consistent with the Montana Department of Natural Resources (DNRC) and Conservation, Water Resources Division, Technical Advisory Committee (TAC) recommended minimum of 3-miles. This recommendation is in the TAC's guidance document for meeting the requirements of the Montana Board of Oil and Gas Conservation (MBOGC) Order No. 99-99 that requires an evaluation of pre-development ground water conditions, plus monitoring and evaluations, including procedures for monitoring and reporting the effects of CBM development on water users.<br>Protection of Reservation groundwater would not rely on a buffer zone. Instead, the operator would be required to conduct geologic and hydrologic evaluations for CBM production wells to be located in areas that may have hydrologic connectivity with Reservation groundwater. When the site-specific studies triggered by the aforementioned criteria determine there would be an effect to Reservation groundwater, the operator must develop and apply measures to prevent the impact of groundwater withdrawal and monitor the effectiveness of such measures. |

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| 2. *Groundwater Monitoring.* The BLM will not issue permits to drill within the 14-mile buffer zone until sufficient hydrological information exists to clearly and convincingly demonstrate that CBM production closer to the Reservation will not cause drawdown of Reservation groundwater resources. Prior to and in the first years of CBM development outside the 14-mile buffer zone, BLM will conduct intensive monitoring within the 14-mile buffer zone to generate site-specific information regarding local aquifer drawdown. Monitoring wells (nested piezometers) will be installed within the buffer zone on the order of at least one cluster per township. A cluster would include well screens in appropriate coal seams, overlying aquifers, and alluvial aquifers. More monitoring wells may be necessary as development increases in the basin and/or water-level declines are observed. The monitoring wells will be located on federal land or, if possible, on private or state land by negotiation. The wells will be installed as soon as possible before production begins to ensure that adequate baseline data is available (at least three years). Water-level measurements will be obtained from each cluster at least once a month. If declining water levels are observed through monthly data collection, a continuously recording data-logger will be installed in the monitoring well to more accurately determine changing water levels. The Tribe will be privy to the design and results of this groundwater monitoring program. | For CBM wells located in aquifers with hydrologic connectivity to Reservation groundwater, the operator would be required to conduct a geologic and hydrologic evaluation prior to field development that identifies the potential for CBM production to affect Reservation groundwater resources.<br>CBM project plans must include measures to prevent the impact of CBM production on Reservation groundwater.<br>When determined necessary by BLM, operators would be required to install monitoring wells to verify the effect of CBM production on Reservation groundwater resources.<br>Specific operator monitoring plans must include a hydrologic evaluation; describe the well location(s), aquifer(s) monitored, parameters monitored, baseline data acquisition, and response actions to adverse monitoring results. All groundwater monitoring data would become public information and made available to the Tribe.<br>BLM may approve CBM production upon completion of the geologic and hydrologic evaluation, and installation and equipping of any required monitoring wells. |
| 3a. *Federal Development within Buffer Zone.* Groundwater modeling based on the site-specific information generated by the above intensive monitoring program will be used by BLM in consultation with the Tribe to determine, in clear and convincing fashion, whether and to what extent federal CBM production can occur within the 14-mile buffer zone without causing drawdown of Reservation groundwater. At least five years of intensive monitoring of the effects of CBM production outside the buffer zone will be required before making any decision on whether to proceed with development within the buffer zone. Such decision will be made in consultation with the Tribe. | Operators would be required to prepare site-specific analysis prior to field development to determine if federal CBM production would affect Reservation groundwater.<br>Where this analysis shows a potential to affect Reservation groundwater, the Tribe would be consulted as to appropriate protection measures.<br>Operators would be required to monitor the impact of CBM production on groundwater throughout the well life and after closure, if necessary. |

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| 3b. *Federal Development within Buffer Zone.* BLM will not issue permits to drill within the buffer zone until sufficient information exists to clearly and convincingly demonstrate that such production will have no adverse effect on Reservation aquifers. Any decision to proceed with drilling within the buffer zone will be made in consultation with the Tribe and consider the likely cumulative impacts from State-authorized production of CBM resources associated with State and private lands. Authorization of federal CBM production within the buffer zone will begin with those tracts farthest from the Reservation that have the least potential to affect Reservation groundwater. | Operators would be required to provide an analysis of the hydrologic impact of CBM production wells and identify any potential effect to Reservation groundwater resources.<br>The Powder River Basin Controlled Groundwater Area standards would be applied by the state, to state and private leases, and would be enforced by BLM on federal leases.<br>Where there is a potential for affecting Reservation groundwater, monitoring plans would be developed by the operator and approved by BLM in consultation with the Tribe.<br>Site-specific analysis would determine the timing of CBM production adjacent to the Reservation. |
| 3c. *Federal Development within Buffer Zone.* After commencement of production, monitoring of groundwater will be expanded to verify that CBM production does not result in any drawdown of Reservation groundwater, all in consultation with the Tribe. Prior to production, monitoring wells (nested piezometers) will be installed along the northern and eastern boundaries of the Reservation on the order of at least one cluster (see # 2, above) per adjacent township. More wells may be necessary as development increases in the basin and/or water-level declines are observed. The wells will be installed as soon as possible before development to ensure that adequate baseline data is available (at least three years). Water-level measurements will be obtained from each cluster at least once a month. If declining water levels are observed through monthly data collection, a continuously recording data logger will be installed in the monitoring well to more accurately determine changing water levels. | Operators may be required to expand their monitoring plans as production continues if a decline in Reservation groundwater levels occurs that is attributable to their operations.<br>Operators may be required to fund or install monitoring wells on Reservation lands in order to document impacts to Tribal resources. Monitoring wells placed on the Reservation would be subject to approval by the Tribal government. All results of groundwater monitoring would become public information.<br>Regional monitoring wells, independent of specific operators, are currently being installed by the BLM and USGS. The USGS is installing 6 well clusters along the southern boundary of the Northern Cheyenne Reservation. The BLM is installing 9 well clusters throughout the PRB study area. These regional wells would assist in identifying groundwater drawdown impacts from CBM development. The BLM plans to install additional monitoring wells in 2003 and 2004. |

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| 4a. *State-Authorized Development within Buffer Zone.* If, prior to the decision to proceed with Federal development of CBM resources within the 14-mile buffer, the State authorizes CBM development within the buffer, the Federal government will act to protect the Tribe's groundwater resources by funding the on-Reservation groundwater monitoring outlined above. | BLM would continue to participate in programs to collect data from existing monitoring wells and install additional monitoring wells to provide for monitoring of impacts to Reservation groundwater levels. |
| 4b. *State-Authorized Development within Buffer Zone.* Prior to any state-authorized CBM development, the BLM and other federal agencies will assist the Tribe in negotiating and obtaining agreements with the State of Montana and private landowners to protect Tribal resources from such development. Such agreements may well require: (a) installation of a hydrologic barrier consisting of a series of wells between the Reservation and developing fields that inject water into the coal seam(s) to maintain the hydrostatic pressure in the formation and prevent the depletion of groundwater; (b) provision of alternative water supplies by drilling deeper wells or conveyance of water from locations not affected by CBM development; and (c) compensation to the Tribe and its members for any accrued damage. | The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis.<br>The BLM would use all reasonable means to assure that Reservation groundwater is not adversely affected by off-Reservation CBM development and that impacts to groundwater can be prevented. |
| 5a. *Remedies for Damage to Reservation Groundwater Resources.* If monitoring wells located along the Reservation boundary detect measurable water level declines from the baseline, BLM will immediately halt any federally authorized production within the buffer zone. | BLM would require operators to modify federal CBM production if monitoring shows production is resulting in an effect to groundwater on the Reservation. BLM requirements could include reducing production rates, shutting in the well, or requiring the operator to provide compensation to the Tribe.<br>The operator must mitigate the impact of groundwater withdrawal prior to resuming full production. |
| 5b. *Remedies for Damage to Reservation Groundwater Resources.* The United States will also take legal action on behalf of the Tribe (or fund legal action by the Tribe) to halt any State-authorized production that is causing such water level declines on the Reservation and to obtain compensation for all accrued damage to the Tribe and its members. | The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis. |
| **B. Protection of Reservation CBM Resources** | |
| 1. *CBM Monitoring.* The groundwater monitoring described in Section I.A. will also include close monitoring of hydrostatic pressure and analysis of CBM drainage within the buffer zone. | BLM would use its existing regulations (43 CFR 3160) to require that operators provide the production data and analysis needed for BLM to determine if drainage of Reservation CBM is occurring. |

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| 2a. *Federal Development within Buffer Zone.* BLM will not issue permits to drill within the 14-mile buffer zone until sufficient information exists to clearly and convincingly demonstrate that CBM production will not drain Reservation methane resources. Any decision to proceed with production within the buffer zone will be made in consultation with the Tribe and consider the likely cumulative impacts on Reservation CBM reserves from state-authorized production of state and private CBM resources. | The BLM has a responsibility to use reasonable means to prevent drainage of Reservation CBM from extraction on federal lands.<br>Operators would be required to provide an analysis prior to field development in areas of potential drainage of Reservation CBM resources. In this analysis, operators must demonstrate that CBM production would not be likely to drain Reservation CBM resources. |
| 2b. *Federal Development within Buffer Zone.* At least five years intensive monitoring of CBM drainage from CBM production outside the buffer zone will be required before any decision to proceed with development within the buffer zone. | Specific evaluations would be required for CBM wells drilled in areas that could potentially drain Reservation CBM. Such evaluations would include modeling of CBM reservoirs to calculate the potential for drainage of Reservation CBM. All evaluations would be made available to the Tribe. |
| 2c. *Federal Development within Buffer Zone.* Authorization of federal CBM production within the buffer zone will begin with those tracts farthest from the Reservation that have the least potential to drain Reservation CBM resources. | Operators would be required to provide analysis prior to field development to determine whether and to what extent federal CBM production would drain Reservation CBM.<br>The analysis would be used by BLM to determine the timing of CBM production adjacent to the Reservation boundary in order to protect Reservation CBM resources from drainage. |
| 2d. *Federal Development within Buffer Zone.* After commencement of production, CBM drainage monitoring will be implemented along the Reservation boundary as provided in Section I.A. above to verify that CBM production does not result in any drainage of Reservation methane resources. | Operators may be required to provide updated information for reservoir modeling during production in order to monitor the potential for drainage of CBM resources from the Reservation. |

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| 3a. *State-Authorized CBM Development within Buffer Zone.* If prior to the decision to proceed with federal development CBM resources within the 14-mile buffer, the state authorizes CBM development within the buffer, BLM and other federal agencies will protect the Tribe's CBM resource by funding a full characterization of Reservation CBM resources and on-Reservation monitoring of CBM drainage. | The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis.<br>The BLM and the Technical Advisory Committee (TAC) are developing a regional monitoring program. Part of BLM's program during the first year of groundwater monitoring includes drilling, equipping, and testing monitoring wells adjacent to the Crow and Northern Cheyenne Reservations. The intent of the monitoring is to establish baseline data in advance of development and to determine if there are CBM impacts to Tribal resources. The Tribe, through its efforts with the USGS, would also have baseline data through its current drilling efforts. The USGS is installing 6 monitoring well clusters along the southern Reservation boundary. The Tribe could participate as a member of the TAC in order to be involved in the process and provide recommendations for mitigation measures. The guidance document developed by the TAC within the Powder River Basin Controlled Ground Water Area (PRBCGA) would assist CBM operators in complying with the technical requirements described in the PRBCGA Final Order and Montana Board of Oil and Gas Conservation Order No. 99-99. The PRBCGA Final Order identifies essential elements necessary for detecting and mitigating impacts from CBM development that needs to be addressed for groundwater characterization and monitoring plans.<br>The BLM monitoring wells are being installed in nine clusters distributed throughout the PRB, with well clusters near the southern boundary of the Northern Cheyenne Reservation in the Bull Creek and Dale Creek drainages. The BLM plans to install additional monitoring wells in 2003 and 2004. |
| 3b. *State-Authorized CBM Development within Buffer Zone.* Prior to any state-authorized CBM development within the 14-mile buffer zone, the BLM and other federal agencies will assist the Tribe in negotiating and obtaining agreements with the State of Montana and private landowners to protect Reservation CBM resources. Such agreements may well require: (a) installation of a hydrologic barrier consisting of a series of wells between the Reservation and developing fields that inject water into the coal seam(s) to maintain the hydrostatic pressure in the formation and prevent the drainage of CBM, and (b) financial compensation to the Tribe or Tribal allottees for any CBM drained from Reservation lands and any other associated damage. | The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis.<br>In order to protect the correlative rights of the Tribe, the BLM would represent the Tribe at Montana Board of Oil and Gas Conservation (MBOGC) hearings that set spacing units for the production of CBM resources, including state and private lands. The BLM would work with the MBOGC under its existing Memorandum of Understanding to protect Tribal resources that may be affected by state or private permits or establishment of CBM spacing units adjacent to Tribal resources. In addition, the BLM, as a member of the technical advisory committee administered by the DNRC Water Management Division, would make recommendations to the MBOGC on the Tribe's behalf regarding monitoring requirements and mitigation of impacts. |

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| 4a. *Remedies for Damage to CBM Resource.* If monitoring wells located along the Reservation boundary detect CBM drainage, BLM will immediately halt any federally authorized production within the 14-mile buffer zone. | The interests of the Tribe would be considered prior to authorization of Federal production that may potentially drain Reservation CBM resources. In establishing well spacing on Federal lands, protection against drainage of Reservation CBM resources would be a priority. If monitoring or reservoir modeling indicates drainage of CBM resources is occurring, the BLM would enter negotiations with the operator and the Tribe to protect the correlative rights of the Tribe. BLM requirements could include reducing production rates, shutting in the well, establishment of communitization agreements, or requiring the operator to pay compensatory royalty. |
| 4b. *Remedies for Damage to CBM Resource.* The United States will take legal action on the Tribe's behalf (or fund legal action by the Tribe) to halt any state-authorized production that is found to be draining CBM resources from the Northern Cheyenne Reservation and to obtain compensation for all accrued damage to the Tribe and its members. | The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis.<br>To protect the correlative rights of the Tribe, the BLM would represent the Tribe at the MBOGC hearings that set well spacing for production of CBM resources on state and private lands. The BLM will work with the MBOGC under its existing MOU to protect Tribal resources that may be affected by approval of state or private permits or establishment of CBM well spacing units adjacent to Tribal resources. |
| 5. *Northern Cheyenne Involvement in Monitoring and Analysis.* Training and employment will be provided to qualified and available Tribal members to involve them, to the fullest extent feasible, in all programs set forth in this Mitigation Plan to monitor and analyze effects on Reservation groundwater, CBM resources, surface water, air quality and subsistence and cultural sites and values. | The monitoring programs sponsored by BLM are open to contracting by qualified Tribal members or companies. |
| **C. Reservation Surface Water** | |
| 1. *Reinjection or Treatment.* All produced water from development of federal CBM resources upstream of the Reservation in both Montana and Wyoming will either be reinjected (as provided for in DEIS Alternative B) or treated prior to discharge to meet the Northern Cheyenne Tribe's surface water quality standards (as provided in DEIS Alternative D). A special emphasis is placed on the Sodium Adsorption Ratio (SAR) and Electrical Conductivity (EC) parameters, especially during the irrigation season. Surface water flow and quality will be monitored to ensure that illegal discharges are not occurring. BLM or other federal agencies will provide the Tribe with funding to cover the costs of surface water monitoring on the Reservation. | Management of all federal produced water would be required to comply with Onshore Oil and Gas Order #7. Operators would be required to submit and receive approval of produced water management plans as part of their drilling and production plans. The water management plans would have to specify water treatment, disposal, and monitoring methods that would be followed in order to meet the state and EPA or Tribal water quality standards at the point of compliance. BLM would not approve any produced water permit applications until any necessary State, EPA, or Tribal permits required for water management actions were obtained. |

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| 2. *Effluent Guidelines and Standards of Performance.* To address discharges of CBM production water from state-authorized development in Montana and Wyoming, EPA will promulgate effluent limitation guidelines under Section 304(b) of the Clean Water Act and/or national standards of performance for CBM production wells under Section 306 of the Act. These standards and guidelines will require reinjection or treatment of produced water from new production wells. In addition, BLM and EPA, in conjunction with the Tribe, will encourage the states of Montana and Wyoming to negotiate a permanent agreement that includes the Tribe as a contracting party and that requires the State of Wyoming to prevent degradation of the Tongue River from Wyoming-authorized discharges. | The EPA and the state would need to determine the utility of promulgating effluent limits. The BLM would require operators to adhere to final regulations promulgated by the proper entity.<br>The EPA and the states of Wyoming and Montana would need to determine the utility of an agreement on degradation of the Tongue River. |
| **D. Reservation Air Quality** | |
| 1. *Increment Analysis and Prevention of Significant Deterioration.* The FEIS will include a regulatory "PSD Increment Consumption Analysis" for all relevant parameters and analyze the impact of such consumption on the potential for future economic development on the Reservation. It is not acceptable to the Tribe that this analysis be done in a piecemeal fashion as CBM wells and compressor stations are permitted. On the basis of this increment consumption analysis, BLM's record of decision must provide for a development plan that is not likely to result in significant consumption of the Reservation's PSD Class I increment for any relevant parameter. | The BLM requires permitted actions on public lands (including oil and gas development) to comply with all applicable local, state, tribal, and federal air quality laws, regulations, standards, and implementation plans.<br>BLM does not have the responsibility or authority to conduct a regulatory PSD Increment Consumption Analysis. However, the EIS predicts the potential for certain impacts and provides that a regulatory PSD Increment Consumption Analysis be conducted by the appropriate air quality regulatory agency (i.e., the Montana DEQ or the EPA) during permitting of specific CBM development. This analysis would assess the likelihood of an exceedance and could be used to develop conditions to prevent a significant consumption of a Class I increment if an exceedance is determined likely.<br>Operators would be required to provide the information necessary for BLM to conduct an analysis of air quality impacts for all relevant parameters when submitting their exploration APDs or field development project plans. BLM would use the information to determine the individual and cumulative impact on the Reservation's air quality; disclose the analysis results in the appropriate NEPA document; and consult with the Tribe when the analysis shows impacts from a specific drilling or development proposal. |
| 2. *Mitigation.* The BLM should implement all measures to minimize air quality degradation suggested in Alternative B of the PFEIS. These include: appropriately surfacing roads and well locations to reduce fugitive dust generated by traffic; applying dust suppressors; enforcing speed limits on all project roads; minimizing construction of roads; air quality; requiring use of natural gas-fired and electric compressors; and optimizing the number of wells connected to one compressor. | Approval of exploration APDs and field development plans would include an analysis of the individual and cumulative impacts to air quality and be conditioned to prevent violations of applicable air quality laws, regulations, and standards. Mitigating measures may include surfacing roads and well locations; applying dust suppressants; requiring operators to develop and enforce speed limits on project roads; minimizing construction of roads; requiring use of natural gas-fired and electric compressors; and optimizing the number of wells connected to one compressor. |

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| 3. *Monitoring.* The BLM and other federal agencies will assist the Tribe in carefully monitoring impacts to the Reservation's air quality, including consumption of the Class I increment. Air quality monitoring should be conducted on the southern and eastern boundaries of the Reservation by continuous real time monitoring systems to ensure that Class I standards are not exceeded and that substantial consumption of Class I increment is not being consumed. Areawide monitoring will also occur within the 14-mile buffer zone. The location and frequency of air-quality monitoring will be determined based on the level of production in particular areas and climatic conditions. | Operators would conduct air quality monitoring, if required, as part of their individual air quality permits issued by the applicable air quality regulatory agency. This could require monitoring of air quality on the Reservation where there is a potential for impacts.<br>Other federal agencies, primarily EPA, should be contacted to request assistance with general monitoring of Reservation air quality. |
| 4. *Modeling.* BLM should regularly update the air quality model developed as part of the NEPA process as new data is collected within the basin. If the updated model forecasts unanticipated impacts on Reservation air quality, BLM will take corrective action to limit further CBM development in the vicinity of the Reservation. | Operators must provide information necessary for BLM to conduct an analysis of potential air quality impacts for all relevant parameters when submitting their exploration APDs and field development plans. BLM would periodically review these air quality modeling analyses in consultation with the Tribe. |
| 5. *Remedies.* If monitoring and modeling finds that off-Reservation CBM development is causing or threatening to cause significant consumption (to be precisely defined for each relevant air quality parameter in consultation with the Tribe) of the Reservation's Class I increment for any relevant parameter, BLM will take measures to restrict the timing or location of CBM development in the vicinity of the Reservation so that consumption of the air quality increment will be reduced to less than significant levels. | Operators in the vicinity of the Reservation may be required to restrict the timing or location of CBM development if monitoring or modeling by the air quality regulatory authority finds their CBM development is causing or threatening to cause non-compliance with applicable local, state, tribal, and federal air quality laws, regulations, standards, and implementation plans. |
| **E. Reservation Wildlife Resources** | |
| 1. Prior to further CBM development in the Powder River RMP area, BLM will fund a wildlife study by a contractor chosen in consultation with the Tribe that: (a) fully assesses the likely impact of off-Reservation CBM development on the wildlife resources of the Northern Cheyenne Reservation; and (b) evaluates measures, such as establishing buffer zones and wildlife refuges to protect critical habitat, that will prevent and avoid significant impacts to Reservation wildlife resources. | The mitigating measures for wildlife are part of the standard APD review and approval process. In addition, impacts on wildlife, including those species on and adjacent to the Reservation, would be monitored and addressed per the *Wildlife Monitoring and Protection Plan* (see Wildlife Appendix).<br>The Tribe would be invited to participate in the "steering group" that would evaluate information gathered during the inventory and monitoring phases of the *Wildlife Monitoring and Protection Plan.* |
| 2. Based on the findings of the wildlife study and in consultation with the Tribe, BLM will implement, in the form of additional RMP amendments, leasing stipulations, or operating plan conditions, all measures found necessary to fully protect Reservation wildlife resources from the impacts of off-Reservation CBM development. | The results of the *Wildlife Monitoring and Protection Plan* would be used to adjust conditions of approval at the APD stage. This includes measures needed to protect Reservation wildlife from the impacts of CBM development. |

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| **F. Noxious Weeds** | |
| 1. Operating plans will provide that vehicles and equipment associated with CBM exploration or development must be thoroughly washed to remove seeds before passing through the Reservation. This requirement should include all personnel including operators, construction workers, contractors, and researchers. | Operators are responsible for noxious weed control on all drill pads, roads, pipelines, and other production related sites for the life of the facility. Operators would be required to include plans to prevent the spread of noxious weeds as part of their development plans. The noxious weed prevention plans must include measures to prevent the spread of weed seeds from any vehicles and equipment prior to mobilizing it to the project area (this would include contractors and researchers). |
| 2. Operating plans will provide for mandatory training of all employees and contractors in noxious weed awareness and prevention. | The Operator would be responsible for the training of employees in noxious weed awareness and prevention. Training would be one required component of the operator's noxious weed prevention plans. |
| 3. Operating plans and permits to drill will require use of common corridors and minimization of roads within the development area as provided in Alternative B to the DEIS to reduce the spread of noxious weeds in the region. All development roads will be restored to the original contours and re-vegetated with the appropriate native and/or hearty vegetation. At least two years of monitoring at the abandoned production field is required to ensure that noxious weeds have not invaded the area. | Operator reclamation plans for access roads and drill sites would include recontouring to near original contour and seeding the area with a certified weed-free seed mix. Upon abandonment, revegetated areas would require at least two growing seasons before bond release in order to ensure that a self-sustaining stand of weed free vegetation had been established. |
| ***Part II, Socioeconomic:***<br>**A. Specific Socioeconomic Mitigation Measures** | |
| The following *Employment Preference* [1a and 1b] will apply to all federal and state CBM leases that include lands within 25 miles of the Reservation boundary. | The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off reservation CBM development (see Chapter 4).<br>The BLM does not have the authority to require operators outside the Reservation boundary to preferentially hire Native Americans. |
| la. *Employment Preference*. Indians who live on or near the Northern Cheyenne Reservation and are qualified and available ("Qualified Indians") will be given preference in recruitment, training, hiring, promotion, and reductions in work force, in all categories of employment in operations on or near the lease. | The proposed employment preferences can only be required for tribal lease operations on the Reservation.<br>The BLM does not have the authority to require operators outside the Reservation boundary to preferentially hire Native Americans. |

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| 1b. *Employment Preference.* The employment preference will be implemented under the terms of a separate written agreement between the Tribe and the lessee. Negotiation of this agreement will commence as promptly as possible and be conducted with diligence and good faith. To expedite the negotiation, the United States, State of Montana, and Tribe will diligently and in good faith promptly concur on a Model Employment Agreement as a guide. Without limitation, the Model Employment Agreement and each Tribe-lessee agreement will include the terms and conditions set forth in i through iv below. Each Tribe-lessee agreement must be approved by the United States as to leases of federally-owned CBM, and the state as to leases of state or privately-owned CBM:<br>i. Special programs for the recruitment of qualified Indians.<br>ii. Special programs for the training of qualified Indians, including on-the-job training and training for advancement into supervisory positions.<br>iii. Special workshops for other project work force to develop an awareness of Indian culture and concerns and an understanding of the need for and requirements of the employment preference.<br>iv. Preservation of the lessee's authority to establish reasonable, even-handed, and job-validated training programs, employment criteria, and work rules for all employees, including qualified Indians.<br>v. Notification to all involved labor unions of the existence of the employment preference and of the lessee's duty and intent to abide by its terms.<br>vi. A requirement that project contractors and subcontractors assume and comply with all terms and conditions of the employment preference in connection with their own project employment practices. | The proposed employment preferences agreement can only be required for tribal lease operations on the Reservation.<br>The BLM does not have the authority to require operators outside the Reservation boundary to enter into the employee preference agreement. |
| 2. The following *Contracting Preference* (2a and 2b) will apply to all federal and state CBM leases that include lands within 25 miles of the Reservation boundary. | The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off-Reservation CBM development (see Chapter 4).<br>The BLM does not have the authority to require operators outside the Reservation boundary to preferentially contract with Northern Cheyenne Contractors. |

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| 2a. Businesses that are majority-owned and controlled by the Northern Cheyenne Tribe and/or its members ("Northern Cheyenne Contractors") will be given preference in the awarding of all contracts and subcontracts for the conduct of operations on or near the lease, and for the procurement of material and equipment for such operations. | The proposed contracting preferences can only be required for tribal lease operations on the Reservation.<br>The BLM does not have the authority to require operators outside the Reservation boundary to preferentially contract with Northern Cheyenne Contractors. |
| 2b. These preferences will be implemented under the terms of a separate written agreement between the Tribe and the lessee. Negotiation of this agreement will commence as promptly as possible and be conducted with diligence and good faith. To expedite the negotiation, the United States, State of Montana, and Tribe will diligently and in good faith promptly concur on a Model Contracting Agreement as a guide. Without limitation, the Model Contracting Agreement and each Tribe-lessee agreement will include the terms and conditions set forth in i through iii below. Each Tribe-lessee agreement must be approved by the United States as to leases of federally-owned CBM, and the state as to leases of state or privately-owned CBM:<br>i. A fair and objective procedure under which a business entity applying for the status of Northern Cheyenne Contractor must be certified in the following two respects:<br>(1) as an entity actually majority-owned and controlled by the Tribe and/or a Tribal member; and<br>(2) as an entity capable of competently providing particular contract services or supplying particular material or equipment.<br>ii. Advance notice to certified Northern Cheyenne Contractors of service or procurement contracts to be awarded for which they are qualified.<br>iii. A requirement that project contractors and subcontractors assume and comply with all terms and conditions of these preferences in connection with their own project contracting and procurement practices. | The proposed contracting preferences agreement can only be required for tribal leases issued for operations on the Reservation.<br>The BLM does not have the authority to require operators outside the Reservation boundary to enter into the contracting preference agreement. |
| 3. *Law and Order; Traffic.* The following (3a thru 3e) will apply to all federal and state CBM leases that include lands within Rosebud, Powder River and Bighorn Counties. | The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off-Reservation CBM development (see Chapter 4).<br>The BLM does not have the authority to require law and order adherence covenants from operators for off-Reservation CBM development.<br>Compliance with applicable traffic laws is necessary for all individuals and companies when operating on public roads within the Reservation. |

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| 3a. The lessee will obtain a covenant from each of its employees that while on the Reservation for any purpose, the employee will comply with all standards of conduct generally applicable to Tribal members. | The proposed covenant can only be required for tribal leases issued for operations on the Reservation.<br>The BLM does not have the authority to require lessees outside the Reservation boundary to require their employees to sign the general conduct covenant. |
| 3b. Each lessee will obtain a covenant from each of its truckers that while operating on the Reservation, the trucker will comply with all laws, ordinances and rules applicable to the use of motor vehicles by Tribal members. | The proposed covenant can only be required for tribal leases issued for operations on the Reservation.<br>The BLM does not have the authority to require lessees outside the Reservation boundary to require their truckers to sign the traffic covenant. |
| 3c. Each lessee will by contract require (i) each of its contractors and subcontractors to obtain like covenants from their employees and truckers, and (ii) each of its suppliers to obtain a like covenant from their truckers. | The proposed covenant can only be required for tribal leases issued for operations on the Reservation.<br>The BLM does not have the authority to require lessees outside the Reservation boundary to require their contractors and subcontractors to sign a covenant. |
| 3d. The above described duties imposed on employees and truckers will be enforced by each lessee, and its contractors, subcontractors, and suppliers, by taking appropriate employee-related disciplinary action in the event such duties are violated. | The BLM does not have the authority to require lessees outside the Reservation boundary to discipline individual employees. |
| 3e. These provisions will be implemented under the terms of a separate written agreement between the Tribe and each lessee. Negotiation of this agreement will commence as promptly as possible and be conducted with diligence and good faith. To expedite the negotiation, the United States, State of Montana, and Tribe will diligently and in good faith promptly concur on a Model Law and Order/Traffic Agreement as a guide. Without limitation, the Model Law and Order/Traffic Agreement and each Tribe-lessee agreement will include the term and conditions set forth in i through v below. Each Tribe-lessee agreement must be approved by the United States as to leases of federally-owned CBM, and the state as to leases of state or privately-owned CBM:<br>i. Assumption in writing by each employee and trucker of the conditions set forth in a through d above.<br>ii. Education of employees and truckers with respect to the standards of conduct they must observe while on the Reservation.<br>iii. Appropriate employee-related disciplinary action for particular violations.<br>iv. Resolution of disputes concerning the occurrence of violations.<br>v. Notification to all involved labor unions of the existence of the written agreement and the lessee's duty and intent to abide by its terms. | The proposed agreement can only be required for tribal leases issued for operations on the Reservation.<br>The BLM does not have the authority to require lessees outside the Reservation boundary to require their contractors and subcontractors to sign the written agreement. |

| Northern Cheyenne Tribe—Proposed Mitigation | BLM Mitigation Measures Under Alternative E |
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| 4. *Impact Funding.* The Tribe proposes the following impact funding program described in 4a through 4e. | The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off-reservation CBM development (see Chapter 4).<br>The BLM does not have the authority to require impact funding. |
| 4a. The Federal government returns 50% of all CBM lease bonuses, rentals and royalties to the state ("Off-Reservation Federal Impact Funds"). By federal statute, these funds are to be used to mitigate socioeconomic impacts of CBM development on local communities. In the region, these impacts can be expected to occur in Big Horn, Rosebud, and Powder River Counties (the "Three County Area"), both on and off the Reservation. No portion of the off-Reservation Federal Impact Funds will be made available to the Tribe. | Of the monies received from sales, bonuses, and royalties on federal public domain leases, 50% is returned to the state or its governmental subdivisions where the leases are located. The state legislature is the body that controls disposition of the monies received and determines the priority of fund distribution to those subdivisions economically impacted by development. BLM does not have the discretion or authority to redistribute federal royalties. |
| 4b. The Tribe will be provided with a degree of proportionate funding. | Of the monies received from sales, bonuses, and royalties on federal public domain leases, 50% is returned to the state or its governmental subdivisions where the leases are located. The state legislature is the body that controls disposition of the monies received and determines the priority of fund distribution to those subdivisions economically impacted by development. BLM does not have the discretion or authority to redistribute federal royalties. |
| 4c. The impact funding will be provided to the Tribe for the exclusive purpose of planning and providing public services and facilities on the Reservation. | Of the monies received from sales, bonuses, and royalties on federal public domain leases, 50% is returned to the state or its governmental subdivisions where the leases are located. The state legislature is the body that controls disposition of the monies received and determines the priority of fund distribution to those subdivisions economically impacted by development. BLM does not have the discretion or authority to redistribute federal royalties. |
| 4d. The funding will be calculated by taking the amount of off-Reservation Federal Impact Funds generated by all federal CBM leases that lie in whole or in part in the Three County Area, dividing by the off-Reservation resident population of the Three County Area, and then multiplying by the resident population of the Reservation. | The BLM does not have the authority to redistribute the federal royalties. |
| 4e. The funding will be provided to the Tribe at the same time that the off-Reservation Federal Impact Funds are provided to the state. | The BLM does not have the authority to redistribute the federal royalties. |

| Northern Cheyenne Tribe—Proposed Mitigation | BLM Mitigation Measures Under Alternative E |
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| 4f. There are several possible sources for the impact funding, including without limitation the following and combinations thereof: (1) entirely from the lessees, via lease stipulations, permit conditions or operating plans; (2) from the lessees, but at no cost to the lessees, through exercise of the Secretary's existing authority under 30 USC §209 to grant royalty reductions to lessees, accompanied by a commitment from the lessees to pay to the Tribe an amount equal to the royalty reductions; (3) from the 50% share of the federal lease bonuses, rents, and royalties retained by the United States. Presumably, this will require federal legislation. | The BLM does not have the authority to require impact funding.<br>A royalty rate reduction cannot be legally granted to the lessees to offset payments by the lessees for impact funding.<br>The BLM does not have the authority to redistribute the federal royalties. |
| *Part III, Cultural:*<br>**A. Protection of Northern Cheyenne Homesteads** | |
| A buffer zone should be established around the Northern Cheyenne homestead sites in the Otter Creek and Hanging Woman drainages. Since current archaeological survey data is inadequate to identify all these sites, all sections where land records indicate Northern Cheyenne homesteading activity took place should be withheld from CBM exploration and development. These sections are identified in Appendix G to the Tribe's Narrative Report. | Operators would be required to include review of Northern Cheyenne homestead records and evaluation for homesteads in the cultural resource surveys where land records indicate Northern Cheyenne homesteading activity. Specific measures to mitigate impacts to these homesteads would be developed at the APD approval phase.<br>A review of land and mineral ownership maps indicate that one homestead location listed in Appendix C of the Ethnographic Report may be located on an area open to fluid mineral leasing. The location is on split estate with private surface and federal minerals. Prior to any land disturbing activity permitted by the BLM in this location, and with landowner permission, BLM would work with the Northern Cheyenne Tribe and the operator to develop the requirements for inventorying, recording, and evaluating the homestead site. BLM would provide technical assistance to the Tribe in inventorying, recording, and evaluating the homestead site. |
| **B. Protection of Significant Hunting, Fishing and Plant Gathering Areas in Tongue River Valley** | |
| The 14-mile buffer zone proposed by the Tribe to protect Reservation groundwater resources should be adequate to protect culturally significant plant gathering areas within the Tongue River valley. However, if CBM development is authorized within the buffer zone, the following protocols should be followed: | Development is presumed to occur at some future time within the 14-mile area. |

| Northern Cheyenne Tribe—Proposed Mitigation | BLM Mitigation Measures Under Alternative E |
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| 1. No development will be permitted up to five miles east of the Tongue River between Ashland and Birney without mitigation measures designed to avoid disturbance of important hunting, fishing, and plant gathering sites. | In the area east of the Tongue River between Ashland and Birney, with important hunting, fishing, and plant gathering sites, operators would be required to inventory BLM lands for traditional plant gathering sites around the proposed drilling locations. APD approvals may include avoidance or timing restrictions to prevent impacts to identified important hunting, fishing and plant gathering sites. |
| 2. BLM operating plans will require that prior to development in areas within five miles (east) of the Tongue River between Ashland and Birney, the project proponent and BLM will consult with the Northern Cheyenne Cultural Commission to determine the location of any important hunting, fishing, and plant gathering sites. The BLM, in consultation with the Tribes Cultural Commission, will design measures to avoid disturbance of these important areas. | In the area east of the Tongue River between Ashland and Birney, operators would be required to consult with the Northern Cheyenne Cultural Commission to determine the location of any important hunting, fishing, and plant gathering sites. APD approvals would include measures to avoid impacts to these resources using standard terms and conditions. |
| 3. No permits to drill will be issued within three miles of Poker Jim Butte to protect an important medicinal and ceremonial plant gathering area in that location. | Operators would be required to conduct a plant inventory on BLM lands proposed for disturbance near Poker Jim Butte. Impacts on medicinal and ceremonial plant gathering areas could then be mitigated using standard terms and conditions. **Note**: The butte is within the Custer National Forest. |
| 4. BLM will monitor the effects to the Northern Cheyenne subsistence economy from CBM development by funding annual updates to the Tribe's subsistence survey (Northern Cheyenne Tribe 2002). A Wildlife Technical Working Group, whose membership will include Northern Cheyenne and agency wildlife specialists, will routinely review the subsistence data of each year. On the basis of this data, they should recommend changes in leasing stipulations to curtail any noted deleterious effects to Northern Cheyenne subsistence hunting, fishing, and plant gathering. This group will also review all reclamation plans to ensure that habitat diversity around the Reservation is maintained and plants with traditional cultural uses are included in the revegetation seed mixes. | BLM would welcome the participation of the Northern Cheyenne in the "steering group" that would evaluate information gathered during the inventory mid monitoring phases of the Wildlife Monitoring and Protection Plan. |
| **C. Protection of Culturally Important Springs** | |
| 1. The BLM will inventory springs off the Reservation within the 14-mile buffer zone. This will include locating springs by GPS, determining the source of the water, measuring the flow, monitoring water quality parameters, and documenting vegetation growth and condition with photos and video. A comprehensive spring inventory should be conducted at least twice per year. | Operators would be required to inventory all springs supplied by the coal seam producing CBM within the anticipated drawdown radius of their proposed operation. |
| 2. If development is allowed within the 14-mile buffer, no permits to drill will be issued within three miles of an inventoried spring prior to consultation with the Northern Cheyenne Cultural Commission regarding the cultural significance of the spring to the Tribe. | The Northern Cheyenne Cultural Commission would be consulted about the appropriate mitigation if culturally significant springs were located within the anticipated drawdown radius of the operator's proposed development. |

| Northern Cheyenne Tribe—Proposed Mitigation | BLM Mitigation Measures Under Alternative E |
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| 3. Springs that are identified by the Cultural Commission as having special significance to the Northern Cheyenne will be protected by a buffer zone adequate to protect medicinal and ceremonial plants as well as the spiritual beings that inhabit the springs and maintain the current conditions that facilitate traditional cultural use of the springs for prayer, offerings, and ceremonies. The size and shape of the buffer zone will be determined by BLM, in consultation with the Tribe based on the best available hydrological data. | Operators may be required to avoid impacting culturally significant springs as part of the mitigation plan developed under Section 106 of the National Historic Preservation Act. |
| 4. Where drilling is allowed within three miles of a culturally important spring, BLM will monitor the drawdown of aquifers related to the spring on a systematically scheduled basis and provide timely reports of the monitoring data to the Tribe. The Northern Cheyenne Tribe will be full participants in a Technical Working Group that oversees the monitoring. (It could be most cost efficient to have the Northern Cheyenne collect this data and distribute it to all interested parties). | Operators could be required to monitor the condition of culturally significant springs were there is the potential for production activities to impact the springs. This requirement would be triggered by the results of the site specific hydrologic evaluation associated with the APD approval. |
| 5. In keeping with the best adaptive management practices, the BLM will halt pumping CBM production around culturally important springs if monitoring data indicates that dewatering of the spring is occurring or imminent. | Operators must modify federal CBM production if monitoring data shows production is affecting culturally important springs.<br>The operator must implement mitigating measures that would maintain the spring flow prior to resuming full production. |
| **D. Protection of Grave Sites** | |
| To protect grave sites, BLM should not issue permits to drill within a mile of all Tribal burials, graves, or cemeteries (regardless of temporal or Tribal affiliation). | Operators would be required to have a discovery plan as part of their plan of development. The discovery plan would include suspension of operations and notification requirements for state, private, and federal lands in the event human remains are discovered during project construction.<br>Should human remains be discovered during construction, BLM would consult with the Northern Cheyenne on the appropriate distance between the project and gravesite. |

| Northern Cheyenne Tribe—Proposed Mitigation | BLM Mitigation Measures Under Alternative E |
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| **E. Prevention and Mitigation of Impacts to Northern Cheyenne Cultural Resources** | |
| 1. BLM will support (by providing funding, training, and in kind services) the creation of a Tribal Historical Preservation Office (THPO). The THPO will focus on Tribal culture, history, geography, and related research, and on building a Northern Cheyenne Archive. The THPO will be a clearinghouse for cultural resource information and the development of a public outreach program and education program for all grade levels in local schools. | BLM supports the creation of a Northern Cheyenne Tribal Historic Preservation Office. This would need to be done through the National Park Service. BLM cannot commit to funding the office. BLM would share data with the THPO from cultural resource investigations associated with CBM development. This information could then be used for tribal educational and outreach efforts. |
| 2. Mechanisms will be established to enable the Tribe to monitor all site-specific cultural resource work done for CBM development to ensure that all Tribally affiliated properties are recorded and evaluated in a culturally appropriate fashion. This should include, but not necessarily be limited to, the respectful treatment of human remains, items of cultural patrimony, and materials relating to ongoing traditional cultural uses of sites (e.g., offering cloths, etc.). | When tribally affiliated properties would be affected by CBM developments, BLM may require a tribal monitor. Under most normal circumstances, cultural resource work does not require a monitor. |
| 3. All Tribally affiliated properties will be evaluated under the National Historic Preservation Act in accordance with NPS Bulletins 15, 16 and 38. Bulletin 38 evaluations must include face-to-face contacts with Northern Cheyenne cultural resource specialists, culture historians and/or culture committee members. Evaluations will include specific discussions of Cheyenne history and culture as well as scientific values. | All cultural properties recorded as a result of CBM related activities would be evaluated for listing on the National Register of Historic Places. BLM would consult with the Northern Cheyenne Tribe when properties were evaluated as Traditional Cultural Properties. |
| 4. Cultural resource contractors hired by the BLM or project proponents and BLM archaeologists will demonstrate good faith consultation with the Tribe and make every attempt to include Cheyenne cultural resource specialists in all aspects of their work. | This is a current requirement by BLM for both themselves and BLM cultural resource permit holders. |
| 5. Cultural resource technical reports approved by the BLM will follow current best practice standards and be accompanied by public narratives suitable for use in Northern Cheyenne schools. | BLM's report standards are found in the BLM's 8100 Manual and Handbooks and are augmented by current professional standards. When reports contain data that would be of interest to the Tribe or the public, BLM may require the operator's consulting archaeologist to prepare a public narrative of their work. |
| 6. Treatment plans for historic properties (eligible sites) will always give the highest priority to avoidance when the property is eligible as a Traditional Cultural Property (under Bulletin 38). If a site is eligible, only for its scientific value, mitigation through data recovery may be considered if the site can not be avoided. Training opportunities for the Cheyenne in archaeological excavation techniques and/or public awareness programs for Northern Cheyenne students will accompany any excavation of tribally affiliated sites. | Avoidance is BLM's standard policy for not adversely affecting historic properties. BLM would consult with the Northern Cheyenne Tribe for sites that are found eligible as a Traditional Cultural Property. |

| Northern Cheyenne Tribe—Proposed Mitigation | BLM Mitigation Measures Under Alternative E |
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| 7. All well locations and ancillary facilities (roads, pipelines, etc.) that cause ground disturbance will be intensively inventoried for cultural resources. Cultural resources include archaeological sites, plant collecting areas, paint sources, baculite sources, and earthlodges (sacred hills), and bird habitats, e.g., nesting area of birds who participate in Northern Cheyenne ceremonial life. This will require Northern Cheyenne participation in the survey effort to identify paint, plant, and earthlodge sites. | Inventory of well locations and ancillary facilities is a current requirement prior to surface disturbance. Inventory strategies would be discussed as part of the cultural resources section of plans of development. |
| 8. Since CBM development, if permitted, could cause a cumulatively significant amount of ground disturbance, the various site-specific reports should be compiled and the data synthesized into an over-riding and undatable technical document at the end of each field season. In keeping with modern adaptive management strategies, this synthesis will be reviewed by a Cultural Resources Technical Working Group (CRTWG), which should include Northern Cheyenne culture historians/elders and/or Tribal Historical Preservation officers designated by the Tribe along with agency cultural resource specialists. | BLM would provide the Tribe a copy of BLM's annual cultural resources report, which would summarize CBM related cultural resource activities. BLM would participate in the Cultural Resources Working Group. |
| 9. A $300 filing fee will be included in the cultural resource contracts. This filing fee will be allocated to the Northern Cheyenne Tribe for the development and support of the THPO. | The authorities under which BLM currently issues cultural resource use permits and fieldwork authorizations do not provide for the collection of fees. |

[1] "Operator" refers to "oil and gas" operator.

[2] Field development refers to operator requests for approval of additional wells other than in accordance with current spacing (1 well per 640 acres/coal seam).

# SOCIOECONOMICS APPENDIX

# SOCIOECONOMICS APPENDIX

## Attitudes, Beliefs, Lifestyles, and Values

### Population Groups

General information about population groups was developed from a number of sources, including the documents cited in the text. While the generalized characterizations are not likely to apply to all individuals, the intention is to provide an idea of the range of the attitudes and lifestyles of the population subgroups present in the study area.

The study area population is largely rural, with strong ties to the land and to the many small towns. Ranch and farm families are one of the major groups of people living in the study area. They tend to favor traditional land uses and the preservation of intergenerational family operations. They may feel reluctance toward short-term developments that will alter their lifestyle. The study area population also includes long-time small town residents. While these people generally wish to maintain their way of life, at the same time, some may seek to find a compromise between their current situation and gradual development.

Another portion of the population in the study area is Native Americans, many of whom are residents of the three Indian reservations within the study area. These groups generally desire to preserve many elements of their heritage and do not wish to become homogenized into and by the non-Indian culture. At the same time, some tribal members or subgroups are pursuing the development of energy resources for the long-term social and economic betterment of tribal members.

A small but growing population is made up of professionals, craftspeople, retirees, and others who have moved to small towns to enjoy the slower pace of life and various amenities. While the forested areas of western Montana tend to attract more of this group than eastern Montana, these people are present in the study area as well. They may participate in opposition to development proposals that appear to jeopardize the quality of their new lifestyles.

Areas where energy resources are developed often see the influx of people from other areas. Many of these people regard their employment as temporary, expect to move on to other areas, and do not play an integral part in community affairs. Long-term local residents often resent these “outsiders” while at the same time realizing some economic benefits from the business and service demands of these newcomers.

In summary, residents generally value the rural character of their lifestyle. Specific aspects of this lifestyle might include appreciation of wide-open spaces, natural landscape, fresh air and solitude. The lifestyle of rural communities often offers the desirable qualities of neighbors knowing each other, lack of urban problems, relaxed pace, personal freedom, and being a good place to raise children. Longtime residents often want to see continued control of the land at the local level without interference from outside agencies or groups.

### Public Comments from EIS Scoping Process (2001)

The public comments received during the EIS scoping process convey important information about general attitudes toward coal bed methane (CBM) and other energy or mineral development. The vast majority of public comments received during scoping relayed concerns about potential impacts on water quality and quantity. Specifically, commentators were concerned with the discharge of water of poor quality (e.g., saline) and the drawdown of groundwater aquifers.

Public comments are often shaped by an individual’s lifestyle and livelihood. For example, ranching and irrigated agriculture are both dependent on the supply of water. Of the comments received by individuals engaged in farming and ranching, a great many related to concerns about potential degradation of water quality and quantity, in addition to general environmental impacts. The comments reflect a tension between the desire for new development to support the often stagnant rural economies and the concern that such development could harm the environment and the lifestyle qualities for which Montana is known, including natural beauty, wide-open spaces, and solitude.

In general the comments reflect a difference in attitudes toward CBM development among those individuals and organizations that might profit directly from CBM and those that would not. Those who own land or mineral rights where CBM could be developed tend to favor cautious and prudent development for the economic benefits it could bring to them and the local economies. Some who do not stand to benefit directly also favor responsible CBM development as soon as possible, believing the economic benefits are needed urgently to bolster stagnant or failing local economies and in turn help maintain existing rural lifestyles. Particularly in the less affluent portions of the study area, CBM and other resource development may be seen as one of the few means to meet urgent human needs in the form of employment and income.

Other individuals, including those who do not stand to benefit directly from CBM, are concerned that the quality of their life and the environment will be adversely affected; that local benefits will be minor; and that most of the benefits will accrue to outsiders. There is a perception that such outside developers, or "wildcatters," will move into a community, extract the profits, and leave a despoiled environment behind. Rural residents, including those in small developments or neighborhoods, are generally concerned about the potential for CBM development in adjacent areas to disturb the peaceful and pristine setting, to contribute unsightly development, to disturb wildlife, and to threaten the provision of adequate public services.

There is also a perception from some comments that CBM will adversely affect the lifestyles of the Native Americans living in and around the 16-county study area—particularly those on the reservations. Concerns reflect the traditional high value placed on natural resources by these groups, the importance of existing water and other natural resources in tribal economies and cultures, and the opinion that tribal members will be unduly burdened with the costs of development while not receiving many or any benefits.

## Newspaper Reports

One of the largest newspapers in the study area, the *Billings Gazette*, was reviewed for information about local attitudes and concerns related to the socioeconomics of CBM. During the week of February 19, 2001, the *Billings Gazette* presented an in-depth report on CBM development in Wyoming and Montana. While the series was running, readers were invited to register their opinions about the positive and negative aspects of CBM in the Powder River Basin. Because this was not a scientific or statistical survey, the responses are likely to be biased toward those who had a concern or issue to communicate.

Of the 154 responses received, 94 agreed with the statement, "Coal bed methane development will be detrimental to Montana's environment and shouldn't be developed here." Thirty-seven respondents agreed with the statement, "Coal bed methane should be developed in Montana with regulation to reduce negative affects on water and other land uses," and 23 selected the statement, "Coal bed methane will bring jobs and money to Montana and should be developed as soon as possible." (*Billings Gazette* 2001.) Thus, roughly one-third of the respondents supported CBM development and two-thirds did not. A number of other written comments were published, which generally reflect the diversity of opinions described previously in the public comments section.

The results of a poll conducted by Montana State University at Billings was reported in the *Billings Gazette* on November 14, 2001. Of the respondents to this poll, 63 percent indicated support for CBM in Montana if reasonable precautions were taken to protect the environment. Of the remainder of those polled, 11 percent indicated that CBM should not be developed, 11 percent indicated it should be developed as quickly as possible, and 15 percent were undecided.

## Attitudes Toward Public Lands

Attitudes about general social conditions and about U.S. Bureau of Land Management's (BLM's) management of public lands in eastern Montana were gathered by Trent (1991) in interviews with about 100 residents. The results are summarized here from the discussion in the *Big Dry RMP/EIS* (BLM 1995). The residents indicated the most important aspects of their area and community were the outdoors and wide open spaces, good people, a small town atmosphere, keeping the community alive, the ability to earn a living, enjoying outdoor recreation, and, finally, that the area is a good place to raise children.

In relation to use and management of public lands, many of the respondents stated the importance of multiple uses and support for resource protection while allowing a variety of activities on public lands. Vegetation and soils were identified as the resources most important to protect, with livestock grazing and hunting the most favored activities. Recreation was slightly less favored and oil/gas, coal, and other mineral development were less favored than recreation. Concern about local economic conditions was predominant among the respondents. Respondents were concerned about the livestock industry, citing it as the most threatened activity on public lands. The respondents also were concerned with resource protection and preserving special resource values such as wildlife habitat, riparian areas, and wetlands.

Another summary of attitudes toward public lands and resource management is provided in the *Off-Highway Vehicle Final EIS* (U.S. Department of the Interior [USDI] and U.S. Department of Agriculture [USDA] 2001). The document states that social values for lands and natural resources take many forms, such as commodity, amenity, environmental quality, ecology, public use, spiritual, health, and security. In the past, natural resource management tended to emphasize commodity values. An emerging emphasis is a shift from commodities and services to environments and habitats. At the same time, in places where land use has been unrestricted, there is increasing concern by some that new regulations and uses are driving out traditional uses such as livestock grazing and off-highway vehicle use.

## Oil and Gas Development

Other past data on attitudes toward oil and gas development is contained in the report "Natural Resource Development in Montana" (Wallwork and Johnson 1986). The discussion here is summarized from the *Final Oil and Gas RMP/EIS Amendment for Billings, Powder River and South Dakota* (1992). The original study consisted of interviews with 624 Montana adults. Nearly two-thirds of the respondents indicated natural resource development, in general, to be essential to the State's future economic health. The primary benefits were construed to be jobs and income, help the state and local economy, tax revenues, and the provision of needed products. Respondents indicated the primary costs or disadvantages associated with natural resource development would be environmental impacts, pollution, poor reclamation, population growth, and boom-and-bust economic cycles. About three-fifths of the respondents saw little or no conflict between natural resource development and outdoor recreation, while one-fourth felt that the two activities did conflict.

Most respondents in the 1986 interviews felt the following activities should be allowed on government lands: timber cutting (85 percent approval); oil and gas extraction (83 percent); coal mining (78 percent); and hardrock mining (79 percent). Some respondents felt the following activities should be prohibited on government lands: timber cutting (11 percent disapproval); oil and gas extraction (12 percent); coal mining (17 percent); and hard rock mining (15 percent). In response to specific questions about oil and gas leasing and development, about half the respondents felt oil and gas development to be essential to Montana's future economic health, with a higher percentage of respondents in eastern Montana feeling this way. Another third of the respondents indicated oil and gas development to be fairly essential. Responses to the pace of development were evenly split, with nearly 40 percent responding that it was just right and 40 percent feeling it was too slow. Nearly 75 percent of the respondents said they had a favorable impression of the industry. About two-fifths of the eastern Montana respondents rated the industry excellent or pretty good in its behavior as a responsible citizen of the state. Another two-fifths of these respondents rated the industry as only fair or poor in its behavior as a responsible state citizen.

## Northern Cheyenne and Crow Tribes

Attitudes toward coal development among the members of the Northern Cheyenne and Crow tribes are described in the Economic, Social and Cultural Supplement to the *Powder River I Regional Draft EIS* (BLM 1989). While there may be differences in attitudes between coal development and natural gas (CBM), there are also likely to be similarities.

Northern Cheyenne attitudes toward coal development are complex. In general, tribal members have shown a determination to maximize the potential benefits of coal development (such as training and employment opportunities and possible revenue sources) and to minimize the potential adverse effects (such as air quality degradation and increased demand on tribal facilities and services). In spite of the conflict it causes with traditional values and attitudes toward land and resources, many tribal members felt that if mining is going to occur in the area anyway, then the tribe and its members should try to reap some of its benefits as well as bear some of its costs. However, other Northern Cheyenne, particularly some of the more traditional elders, were firmly against energy development because of its disruption to the land and environment. They recognized that there is a need for jobs on the reservation but felt that other jobs that were less disruptive to the land and traditional values must be found.

The attitudes of individual Northern Cheyenne members toward coal development off the reservation reflected their perceptions about whether, and to what extent, they or their friends and family were benefiting from it. Those who were benefiting from coal-related employment or who aspired to do so seemed to be in favor of this development. Those who had been refused coal-related jobs or were not interested in them felt less positive about regional coal development. Many cited both positive effects (mostly jobs) and negative effects (environmental pollution, increased traffic, and drug and alcohol problems) that they believed were associated with the coal mines and power plants that had been constructed since 1970.

For residents of the Crow Reservation, a high level of concern was found regarding the impact that off-reservation coal development could have on the reservation. Three major concerns emerged regarding off-reservation coal development: 1) that it would compete with the marketing and development of on-reservation coal; 2) that reservation services and infrastructure would be affected and experience fiscal shortfalls; and 3) that regional coal development could have an impact on Crow culture and individual behavior such as alcohol and drug abuse. Specific cultural concerns included potential loss or dilution of culture values such as sharing and the importance of family as a result of the exposure to non-Native American values.

Many people on the Crow Reservation, including tribal officials, expressed the concern that federal coal would compete directly with tribal-owned coal. If federal coal is leased, then tribal-owned coal is less likely to be leased. Tribal coal leasing was seen by some members as a way for the tribe to raise money to save its land base and to enhance the tribe's ability to govern itself. If the tribe can generate its own revenues, it can determine how that money is spent and will no longer have to depend on the federal government to address problems.

# Government Revenue Sources

Total county revenues for fiscal year 1999 are presented in Table SEA-1. The table shows that the total revenues collected in the 16 study-area counties accounted for 26.7 percent of the revenues collected by all of the counties in the State. By comparison, the study area population was 31.8 percent of the state total in 2000.

## Taxes

Total taxes collected by counties are shown in Table SEA-2. With some exceptions, taxes account for a large share—often about one half—of total county revenue. Counties that are less reliant on tax revenues have other miscellaneous income or intergovernmental income, generally related to natural resources rents or royalties.

### Property Taxes and Assessed Value

Property taxes are levied by counties on real property and on any specified facilities and/or improvements to that real property.

The assessed value, taxable value, and total property taxes collected for the state and each study area county are presented in Table SEA-2. The average mill levy rate for each county is also shown. Property taxes collected in the 16 study-area counties totaled more than $15 million, which is 31.9 percent of the state total. The percentage of property taxes collected in the study area is consistent with the study area population, which was similarly 31.8 percent of the state total in 2000. The taxes collected in the counties vary widely in accordance with the assessed values, taxable values, and tax rates and mill levies in each county.

### Natural Resource Taxes

Natural resource taxes were a relatively small component of total tax revenues, at $100 million or 6.5 percent. Natural resource taxes include taxes on coal, oil, natural gas, and metals mining. Table SEA-3 shows the State natural gas tax revenues for 1999 and 2000. Total revenues were $11,205,901 in 2000—an increase of 8.1 percent from the previous year.

As shown in Table SEA-1, county revenues from oil and natural gas production taxes and the percent of these revenues compared to total county revenues varied greatly among the 16 study-area counties. For a number of the counties, the income was minimal or zero. The exceptions include Blaine County ($626,111 or 15.7 percent of county revenue), Carbon County ($178,443 or 4.1 percent) and Musselshell County ($256,627 or 7.1 percent). Note: The Oil and Gas Production Tax (LGST) was eliminated after 1999.)

**TABLE SEA-1**
**TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEAR 1999[1]**

| | Revenue Source | Amount | % of County Total |
|---|---|---|---|
| **Big Horn County** | Taxes | $4,481,631 | 44.6% |
| | Licenses and Permits | $114,511 | 1.1% |
| | Intergovernmental | $1,235,480 | 12.3% |
| | Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)** | $5,280 | 0.1% |
| | Charges for Services | $1,364,573 | 13.6% |
| | Fines and Forfeitures | $115,996 | 1.2% |
| | Miscellaneous Revenue | $2,090,577 | 20.8% |
| | Investment Earnings | $643,663 | 6.4% |
| | Total: | $10,046,431 | 100.0% |
| **Blaine County** | Taxes | $1,856,603 | 46.7% |

## TABLE SEA-1
## TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEAR 1999[1]

| | Revenue Source | Amount | % of County Total |
|---|---|---|---|
| | Licenses and Permits | $95,030 | 2.4% |
| | Intergovernmental | $1,482,422 | 37.3% |
| | Oil and Gas Production Tax (LGST)<br>**(Included in Intergovernmental above)** | $626,111 | 15.7% |
| | Charges for Services | $195,137 | 4.9% |
| | Fines and Forfeitures | $38,474 | 1.0% |
| | Miscellaneous Revenue | $165,916 | 4.2% |
| | Investment Earnings | $144,133 | 3.6% |
| | Total: | $3,977,715 | 100.0% |
| **Carbon County** | Taxes | $2,243,839 | 51.8% |
| | Licenses and Permits | $158,176 | 3.7% |
| | Intergovernmental | $1,441,197 | 33.3% |
| | Oil and Gas Production Tax (LGST)<br>**(Included in Intergovernmental above)** | $178,443 | 4.1% |
| | Charges for Services | $196,394 | 4.5% |
| | Fines and Forfeitures | $62,692 | 1.4% |
| | Miscellaneous Revenue | $62,203 | 1.4% |
| | Investment Earnings | $164,215 | 3.8% |
| | Total: | $4,328,716 | 100.0% |
| **Carter County** | Taxes | $1,026,167 | 53.9% |
| | Licenses and Permits | $20,765 | 1.1% |
| | Intergovernmental | $267,473 | 14.1% |
| | Charges for Services | $100,220 | 5.3% |
| | Fines and Forfeitures | $6,569 | 0.3% |
| | Miscellaneous Revenue | $399,562 | 21.0% |
| | Investment Earnings | $82,130 | 4.3% |
| | Total: | $1,902,886 | 100.0% |
| **Custer County** | Taxes | $2,327,867 | 49.8% |
| | Licenses and Permits | $110,737 | 2.4% |
| | Intergovernmental | $1,042,529 | 22.3% |

## TABLE SEA-1
## TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEAR 1999[1]

| | Revenue Source | Amount | % of County Total |
|---|---|---|---|
| | Oil and Gas Production Tax (LGST)<br>**(Included in Intergovernmental above)** | $41,434 | 0.9% |
| | Charges for Services | $484,733 | 10.4% |
| | Fines and Forfeitures | $68,931 | 1.5% |
| | Miscellaneous Revenue | $471,159 | 10.1% |
| | Investment Earnings | $163,813 | 3.5% |
| | Total: | $4,669,769 | 100.0% |
| **Gallatin County** | Taxes | $9,853,528 | 44.8% |
| | Licenses and Permits | $797,126 | 3.6% |
| | Intergovernmental | $3,661,062 | 16.6% |
| | Charges for Services | $6,072,812 | 27.6% |
| | Fines and Forfeitures | $458,497 | 2.1% |
| | Miscellaneous Revenue | 558,876 | 2.5% |
| | Investment Earnings | 608,291 | 2.8% |
| | Total: | 22,010,192 | 100.0% |
| **Golden Valley County** | Taxes | 387,137 | 57.0% |
| | Licenses and Permits | 13,242 | 1.9% |
| | Intergovernmental | 174,519 | 25.7% |
| | Oil and Gas Production Tax (LGST)<br>**(Included in Intergovernmental above)** | 6,415 | 0.9% |
| | Charges for Services | 22,560 | 3.3% |
| | Fines and Forfeitures | 13,219 | 1.9% |
| | Miscellaneous Revenue | 4,967 | 0.7% |
| | Investment Earnings | 63,575 | 9.4% |
| | Total: | 679,219 | 100.0% |
| **Musselshell County** | Taxes | 1,084,288 | 30.1% |
| | Licenses and Permits | 73,915 | 2.0% |
| | Intergovernmental | 739,530 | 20.5% |
| | Oil and Gas Production Tax (LGST)<br>**(Included in Intergovernmental above)** | 256,627 | 7.1% |

## TABLE SEA-1
## TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEAR 1999[1]

| | Revenue Source | | Amount | % of County Total |
|---|---|---|---|---|
| | Charges for Services | | 256,627 | 7.1% |
| | Fines and Forfeitures | | 35,272 | 1.0% |
| | Miscellaneous Revenue | | 1,287,222 | 35.7% |
| | Investment Earnings | | 130,944 | 3.6% |
| | | Total: | 3,607,798 | 100.0% |
| **Park County** | Taxes | | 3,051,367 | 47.3% |
| | Licenses and Permits | | 202,702 | 3.1% |
| | Intergovernmental | | 1,352,106 | 21.0% |
| | Charges for Services | | 1,257,900 | 19.5% |
| | Fines and Forfeitures | | 229,957 | 3.6% |
| | Miscellaneous Revenue | | 109,530 | 1.7% |
| | Investment Earnings | | 241,766 | 3.8% |
| | | Total: | 6,445,328 | 100.0% |
| **Powder River County** | Taxes | | 1,193,285 | 37.7% |
| | Licenses and Permits | | 44,235 | 1.4% |
| | Intergovernmental | | 586,548 | 18.5% |
| | Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)** | | 89,261 | 2.8% |
| | Charges for Services | | 1,177,971 | 37.2% |
| | Fines and Forfeitures | | 29,218 | 0.9% |
| | Miscellaneous Revenue | | 50,028 | 1.6% |
| | Investment Earnings | | 86,243 | 2.7% |
| | | Total: | 3,167,528 | 100.0% |
| **Rosebud County** | Taxes | | 3,736,882 | 50.7% |
| | Licenses and Permits | | 96,804 | 1.3% |
| | Intergovernmental | | 1,627,917 | 22.1% |
| | Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)** | | 14,024 | 0.2% |
| | Charges for Services | | 642,491 | 8.7% |
| | Fines and Forfeitures | | 86,111 | 1.2% |

## TABLE SEA-1
## TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEAR 1999[1]

| | Revenue Source | Amount | % of County Total |
|---|---|---|---|
| | Miscellaneous Revenue | 824,751 | 11.2% |
| | Investment Earnings | 349,646 | 4.7% |
| | Total: | 7,364,602 | 100.0% |
| **Stillwater County** | Taxes | 2,302,415 | 8.3% |
| | Licenses and Permits | 338,758 | 1.2% |
| | Intergovernmental | 24,113,855 | 86.8% |
| | Oil and Gas Production Tax (LGST)<br>**(Included in Intergovernmental above)** | 11,326 | 0.0% |
| | Charges for Services | 256,559 | 0.9% |
| | Fines and Forfeitures | 101,596 | 0.4% |
| | Miscellaneous Revenue | 445,202 | 1.6% |
| | Investment Earnings | 215,360 | 0.8% |
| | Total: | 27,773,745 | 100.0% |
| **Sweet Grass County** | No report received | | |
| **Treasure County** | Taxes | 422,269 | 60.4% |
| | Licenses and Permits | 16,076 | 2.3% |
| | Intergovernmental | 124,734 | 17.8% |
| | Charges for Services | 46,933 | 6.7% |
| | Fines and Forfeitures | 47,409 | 6.8% |
| | Miscellaneous Revenue | 16,561 | 2.4% |
| | Investment Earnings | 25,710 | 3.7% |
| | Total: | 699,692 | 100.0% |
| **Wheatland County** | Taxes | 20,477 | 0.84% |
| | Licenses and Permits | 240,304 | 9.9% |
| | Intergovernmental | 132,438 | 5.4% |
| | Charges for Services | 25,717 | 1.06% |
| | Fines and Forfeitures | 416,588 | 17.2% |
| | Miscellaneous Revenue | 22,246 | 0.92% |
| | Investment Earnings | 1,557,462 | 64.5% |

### TABLE SEA-1
### TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEAR 1999[1]

| | Revenue Source | Amount | % of County Total |
|---|---|---|---|
| | Total: | 2,415,232 | 100.0% |
| **Yellowstone County** | Taxes | 16,996,908 | 44.1% |
| | Licenses and Permits | 2,732,460 | 7.1% |
| | Intergovernmental | 7,946,773 | 20.6% |
| | Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)** | 5,155 | 0.0% |
| | Charges for Services | 8,757,415 | 22.7% |
| | Fines and Forfeitures | 676,103 | 1.8% |
| | Miscellaneous Revenue | 240,406 | 0.6% |
| | Investment Earnings | 1,232,920 | 3.2% |
| | Total: | 38,582,985 | 100.0% |
| **Study Area Total (2)** | | **152,253,514** | |
| **% of State Total** | | **6.7%** | |
| **Montana State Total** | | **569,806112** | |

Source: Montana Department of Commerce, Billings.

[1] Based on unaudited data reported by Counties.

[2] Does not include Sweet Grass County (no data available).

## TABLE SEA-2
## ASSESSED VALUES AND PROPERTY TAX COLLECTIONS BY COUNTY (2000)

| | 2000 Assessed Value | 2000 Taxable Value | Total Property Taxes and fees Collected | Average Mill Levy |
|---|---|---|---|---|
| Big Horn County | $565,023,700 | $21,354,436 | $6,952,144 | 293.77 |
| Blaine County | $284,898,249 | $12,079,607 | $5,685,958 | 362.11 |
| Carbon County | $521,678,159 | $23,754,742 | $9,288,300 | 349.51 |
| Carter County | $120,132,817 | $6,808,649 | $2,382,143 | 329.01 |
| Custer County | $371,459,345 | $14,389,152 | $8,806,856 | 460.53 |
| Gallatin County | $3,133,267,036 | $118,555,127 | $52,607,233 | 361.25 |
| Golden Valley County | $98,470,244 | $5,687,402 | $1,784,283 | 305.79 |
| Musselshell County | $179,355,501 | $6,881,914 | $3,173,428 | 393.23 |
| Park County | $735,065,531 | $28,466,784 | $12,442,895 | 339.82 |
| Powder River County | $125,672,599 | $4,415,991 | $2,227,445 | 463.94 |
| Rosebud County | $1,957,565,773 | $100,635,100 | $20,804,541 | 173.34 |
| Stillwater County | $697,014,674 | $28,705,444 | $10,708,053 | 319.89 |
| Sweet Grass County | $247,083,525 | $9,532,599 | $3,677,085 | 354.74 |
| Treasure County | $86,217,475 | $4,306,117 | $1,646,795 | 329.73 |
| Wheatland County | $162,260,802 | $10,468,500 | $3,263,418 | 297.22 |
| Yellowstone County | $5,245,460,701 | $204,127,734 | $107,952,414 | 378.48 |
| **Study Area Total** | **$14,530,626,131** | **$600,169,298** | **$253,402,991** | -- |
| **% of State Total** | **no data** | **35.7%** | **31.9%** | -- |
| **Montana** | **no data** | **$1,679,739,857** | **$794,598,177** | -- |

Source: Montana Department of Revenue.

## TABLE SEA-3
## MONTANA NATURAL GAS PRODUCTION TAX REVENUES (1999 AND 2000)

| | 1999 | 2000 | % Change 1999-2000 |
|---|---|---|---|
| Natural Gas Tax Revenues | $10,367,718 | $11,205,901 | 8.1% |

Source: Montana Department of Revenue

# SOILS APPENDIX

# SOILS APPENDIX

The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Services (NRCS) has published a general soil association map for Montana in digital format. The State Soil Geographic Database (USDA NRCS 1996) provides a general overview of soils distribution and occurrences in the planning area, and is not suitable for site-specific evaluations. More detailed information is available from the NRCS Regional offices in Montana. General soils information presented in the State Soil Geographic Database is presented in the *Soils Technical Report* (ALL 2001a). Information presented includes the areal extent, soil series characteristics, K-factor (erosion potential), salinity, and sodium adsorption ratio (SAR) for the various soil groups in the Powder River RMP and Billings RMP areas. The *Soils Technical Report* was prepared to present the potential impacts from the coal bed methane (CBM) extraction process on land and the environment, with a focus on impacts to agriculture, and including potential effects on crops, livestock, and soils. The report was used to prepare this section and provides more detailed information pertaining to soils and CBM development impacts to the environment. The complete Soils Technical Report can be accessed at http://www.mt.blm.gov/mcfo.

The layout of the soils in the study area is shown in Figures SOI-1 and SOI-2 for the Billings Resource Management Plan (RMP) Area and Powder River RMP area, respectively. A total of 163 soil mapping units composed of 205 soil series are present in the two RMP areas. The seven principal soil mapping units based on areal extent within the two RMP areas are:

- MT421 Cambeth-Megonot-Manning (4.3 percent)
- MT089 Yamac-Birney-Cabbart (4.3 percent)
- MT676 Yawdim-Delpoint-Thurlow (4.0 percent)
- MT675 Cabbart-Yawdim-Thurlow (3.9 percent)
- MT384 Marvan-Neldore-Bascovy (3.5 percent)
- MT103 Cabbart-Delpoint-Yamac (3.0 percent)
- MT559 Tanna-Rentsac-Yawdim (2.9 percent)

These seven soil mapping units compose 26 percent of the two RMP areas, with the remaining 156 soil mapping units making up the remainder. Table SOI-1 presents all of the soil mapping units in the Billings RMP and Powder River RMP areas, along with the percent of the total RMP areas occupied by each mapping unit. Table SOI-2 presents some of the key soil characteristics related to erosion and salinity for the topmost 25 mapping units based on percent of total area.

Soils in the RMP areas are derived mainly from sedimentary bedrock and alluvium. The soils generally range from loams to clays, but are principally loams to silty clay loams.

Slope and K-factor are values that are used in the estimation of soil erosion potential. Slope values range up to greater than 40 percent; however, there are many soils that have slopes of zero to about 10 percent. Almost all of the soils have low K-factors (below 0.37). Easily eroded soils have a K-factor between 0.37 and 0.69, and resistant soils have a K-factor less than 0.37 (Jarrett 1995). Figures presenting the mean K-factor of the soils in the Billings RMP and Powder River RMP areas are included in the *Soils Technical Report* (ALL 2001a). Figures SOI-1 and SOI-2 are included here to summarize the information.

Soil salinity affects the suitability of a soil for crop production and the stability of the soil. The SAR is the measure of sodium relative to calcium and magnesium, and affects the soil structure and infiltration rate of water. The *Soils Technical Report* presents a more detailed discussion pertaining to the salinity and SAR of the soils in the Billings RMP and Powder River RMP areas. As shown in Table SOI-2, most of the soils are very low in salinity. The SAR values in the study areas and statewide vary widely and, with few exceptions, are low in sodium. Based on the generally fine texture of the surface soils (clayey), much of the soil will likely be susceptible to increasing sodicity when irrigated with water having a high SAR. Permeability is the measure of vertical water movement when the soil is saturated. The soil structure, porosity, gradation and texture all influence the permeability of the soil. Those soils with a coarser texture (sandy to loamy) and good internal drainage (higher permeability) will be the least susceptible to increasing sodicity and salinity. Much of the soil is likely to be irrigable with good management.

## TABLE SOI-1
## AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

| STATSGO Map Unit | Map Unit Name | Acres | Percent of Area |
|---|---|---|---|
| MT001 | Abac-Peritsa-Rock Outcrop | 93,754 | 0.48 |
| MT003 | Absarokee-Castner-Sinnigam | 436,268 | 2.25 |
| MT004 | Absarokee-Wayden-Redcreek Family | 23,322 | 0.12 |
| MT006 | Absarokee-Castner-Grail | 15,901 | 0.08 |
| MT007 | Absarokee-Hilger-Big Timber | 70,560 | 0.36 |
| MT016 | Winler-Lismas-Swanboy | 21,332 | 0.11 |
| MT017 | Archin-Twilight-Bonfri | 78,323 | 0.4 |
| MT019 | Assinniboine-Pring-Archin | 459,121 | 2.37 |
| MT024 | Badland-Bullock-Neldore | 129,347 | 0.67 |
| MT027 | Bainville-Mcrae-Rock Outcrop | 453,939 | 2.35 |
| MT028 | Bainville-Rock Outcrop-Travessilla | 205,254 | 1.06 |
| MT029 | Bainville-Travessilla Family-Evanston | 171,636 | 0.89 |
| MT037 | Beauvais-Hydro-Lambeth | 83,773 | 0.43 |
| MT041 | Bew-Toluca-Nobe | 8,032 | 0.04 |
| MT042 | Big Timber-Cabba-Absarokee | 107,565 | 0.56 |
| MT048 | Bitton-Shambo-Doney | 428,667 | 2.22 |
| MT051 | Blackhall-Twilight-Zeona | 21,144 | 0.11 |
| MT054 | Cabbart-Bonfri-Cambeth | 2 | <0.01 |
| MT055 | Bonfri-Gerdrum-Galbreth | 3,927 | 0.02 |
| MT070 | Bryant-Doney-Shambo | 56,522 | 0.29 |
| MT075 | Yamac-Busby-Cabbart | 104,872 | 0.54 |
| MT076 | Cabba-Travessilla Family-Birney | 121,597 | 0.63 |
| MT078 | Cabba-Campspass-Farland | 6,969 | 0.04 |
| MT080 | Cabba-Farland-Yawdim | 38,170 | 0.2 |
| MT083 | Cabba-Ringling-Yawdim | 300,378 | 1.55 |
| MT084 | Cabba-Ringling-Yawdim | 493,159 | 2.55 |
| MT089 | Yamac-Birney-Cabbart | 827,152 | 4.27 |
| MT090 | Cabbart-Cambeth-Bonfri | 183,942 | 0.95 |
| MT092 | Delpoint-Cabbart-Yamac | 552,861 | 2.86 |

## TABLE SOI-1
## AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

| STATSGO Map Unit | Map Unit Name | Acres | Percent of Area |
|---|---|---|---|
| MT095 | Cabbart-Keiser-Dast | 57,076 | 0.29 |
| MT096 | Cabbart-Pultney Family-Stormitt | 43,281 | 0.22 |
| MT097 | Cabbart-Rentsac-Delpoint | 283,471 | 1.46 |
| MT099 | Cabbart-Rock Outcrop-Twilight | 116,567 | 0.6 |
| MT100 | Cabbart-Twilight-Forelle | 31,738 | 0.16 |
| MT103 | Cabbart-Delpoint-Yamac | 577,016 | 2.98 |
| MT112 | Castner-Savage-Chama | 5,667 | 0.03 |
| MT113 | Castner-Chama-Regent | 4,089 | 0.02 |
| MT114 | Castner-Darret-Windham | 3 | <0.01 |
| MT120 | Wayden-Castner-Cabba | 47,803 | 0.25 |
| MT127 | Chinook-Archin-Delpoint | 6 | <0.01 |
| MT145 | Crago-Musselshell-Attewan | 545,006 | 2.82 |
| MT146 | Crago-Musselshell-Fairfield | 7,046 | 0.04 |
| MT148 | Creed-Gerdrum-Forelle | 1,072 | 0.01 |
| MT152 | Cushman-Yawdim-Bainville | 54,706 | 0.28 |
| MT153 | Danvers-Tinsley-Oburn | 72,675 | 0.38 |
| MT155 | Danvers-Judith-Windham | 49,063 | 0.25 |
| MT157 | Dast-Forelle-Delpoint | 31,137 | 0.16 |
| MT159 | Dast-Mcrae-Travessilla Family | 84,373 | 0.44 |
| MT161 | Degrand-Kremlin-Ethridge | 10,319 | 0.05 |
| MT164 | Cabbart-Delpoint-Yamac | 278,907 | 1.44 |
| MT165 | Delpoint Family-Kirby-Delpoint | 33,440 | 0.17 |
| MT167 | Delpoint-Travessilla Family-Cabbart | 216,026 | 1.12 |
| MT168 | Delpoint-Cabbart-Yamac | 105,771 | 0.55 |
| MT173 | Dolus-Boxwell-Castner | 22,680 | 0.12 |
| MT174 | Doney-Reeder-Cabba | 72,377 | 0.37 |
| MT175 | Doney-Shaak-Wayden | 232,912 | 1.2 |
| MT176 | Doney-Winifred-Wayden | 73,711 | 0.38 |
| MT182 | Starley-Rock Outcrop-Babb | 147,700 | 0.76 |

## TABLE SOI-1
## AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

| STATSGO Map Unit | Map Unit Name | Acres | Percent of Area |
|---|---|---|---|
| MT187 | Ethridge-Kremlin-Marias | 9,089 | 0.05 |
| MT190 | Evanston-Lonna-Tinsley | 19,800 | 0.1 |
| MT193 | Fairway Family-Tetonview-Villy | 8,546 | 0.04 |
| MT209 | Forkwood-Vonalee-Haverdad | 31,675 | 0.16 |
| MT213 | Garlet-Cowood-Rock Outcrop | 298 | <0.01 |
| MT216 | Garlet-Rubble Land-Cowood | 2,132 | 0.01 |
| MT217 | Garlet-Sebud-Cheadle | 22,544 | 0.12 |
| MT218 | Shadow-Garlet-Macfarlane | 257,150 | 1.33 |
| MT224 | Gerdrum-Forelle-Archin | 38,201 | 0.2 |
| MT225 | Harlem-Gerdrum-Ethridge | 26,205 | 0.14 |
| MT228 | Gilt Edge-Absher-Yawdim | 11,675 | 0.06 |
| MT247 | Harlem-Vanda-Marvan | 10,450 | 0.05 |
| MT249 | Stormitt-Harvey Family-Nihill | 48,815 | 0.25 |
| MT252 | Haverson-Heldt-Toluca | 16,832 | 0.09 |
| MT254 | Havre-Glendive-Water | 30,577 | 0.16 |
| MT255 | Havre-Harlem-Attewan | 25,454 | 0.13 |
| MT256 | Havre-Harlem-Glendive | 88,473 | 0.46 |
| MT258 | Havre-Ryell-Harlem | 50,431 | 0.26 |
| MT259 | Havre-Hanly-Glendive | 173,933 | 0.9 |
| MT261 | Havre-Rivra-Water | 114,549 | 0.59 |
| MT263 | Havre-Kobar-Spinekop | 47,424 | 0.25 |
| MT264 | Havre-Glendive-Yamac | 10,938 | 0.06 |
| MT269 | Heath-Charlos-Maurice | 58,449 | 0.3 |
| MT271 | Heldt-Fort Collins-Kobar | 43,967 | 0.23 |
| MT273 | Helmville-Whitore-Tropal | 126,307 | 0.65 |
| MT301 | Keiser-Hydro-Gilt Edge | 112,102 | 0.58 |
| MT309 | Kobar-Yamac-Attewan | 23,490 | 0.12 |
| MT321 | Lamedeer-Ringling-Twin Creek | 35,383 | 0.18 |
| MT323 | Lap-Windham-Armington | 104,714 | 0.54 |

## TABLE SOI-1
## AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

| STATSGO Map Unit | Map Unit Name | Acres | Percent of Area |
|---|---|---|---|
| MT324 | Lardell-Mckenzie-Kobar | 28,542 | 0.15 |
| MT327 | Libeg-Leavitt-Hanson | 17,866 | 0.09 |
| MT336 | Lihen-Delpoint-Tinsley | 5,762 | 0.03 |
| MT338 | Lisam-Abor-Vanda | 303,030 | 1.57 |
| MT339 | Lisam-Abor-Hesper | 28,331 | 0.15 |
| MT349 | Lolo-Work-Shawa | 39,683 | 0.21 |
| MT365 | Maginnis-Absarokee-Rock Outcrop | 116,071 | 0.6 |
| MT369 | Marias-Havre-Harlem | 143,781 | 0.74 |
| MT374 | Martinsdale-Fairfield-Reeder | 7 | <0.01 |
| MT379 | Marvan-Abor-Neldore | 97,192 | 0.5 |
| MT382 | Marvan-Gerdrum-Vanda | 200,503 | 1.04 |
| MT383 | Harlem-Vanda-Marvan | 23,594 | 0.12 |
| MT384 | Marvan-Neldore-Bascovy | 677,263 | 3.5 |
| MT393 | Mcrae-Harlem-Keiser | 103,536 | 0.54 |
| MT396 | Midway-Shingle-Rock Outcrop | 76,447 | 0.4 |
| MT400 | Mirror-Bross-Vasquez | 56,548 | 0.29 |
| MT407 | Moyerson-Rock Outcrop-Orinoco | 253,541 | 1.31 |
| MT414 | Neldore-Abor-Vanda | 7,787 | 0.04 |
| MT415 | Neldore-Abor-Volborg | 93,856 | 0.49 |
| MT421 | Cambeth-Megonot-Manning | 829,387 | 4.29 |
| MT433 | Nunn-Toluca-Heldt | 5,480 | 0.03 |
| MT438 | Bridger-Bynum-Owen Creek | 16,109 | 0.08 |
| MT456 | Pinelli-Glendive-Busby | 4,780 | 0.02 |
| MT459 | Prospect-Sublette-Teton | 9,292 | 0.05 |
| MT466 | Reeder Family-Barvon-Mowbray | 136,554 | 0.71 |
| MT471 | Rentsac-Cabbart-Blackhall | 24,662 | 0.13 |
| MT472 | Yawdim-Rentsac-Lambeth | 149,344 | 0.77 |
| MT474 | Broadus-Ridge-Cabba | 42,375 | 0.22 |
| MT475 | Ringling-Cabba-Relan | 16,537 | 0.09 |

## TABLE SOI-1
## AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

| STATSGO Map Unit | Map Unit Name | Acres | Percent of Area |
|---|---|---|---|
| MT484 | Rock Outcrop-Dryadine-Rubble Land | 3,611 | 0.02 |
| MT485 | Garlet-Rock Outcrop-Cryoborolls | 21,066 | 0.11 |
| MT486 | Rock Outcrop-Hanson-Whitecow | 159,584 | 0.82 |
| MT488 | Rock Outcrop-Midway-Travessilla Family | 236,799 | 1.22 |
| MT489 | Abor-Rock Outcrop-Delpoint | 17,571 | 0.09 |
| MT492 | Rock Outcrop-Rubble Land-Cowood | 127,770 | 0.66 |
| MT497 | Rock Outcrop-Water-Rubble Land | 68,075 | 0.35 |
| MT499 | Romberg-Calicott-Hiland | 28,655 | 0.15 |
| MT500 | Romberg-Naturita-Heldt | 40,683 | 0.21 |
| MT519 | Savage-Forelle-Frazer | 68,982 | 0.36 |
| MT522 | Savage-Work-Chama | 4,497 | 0.02 |
| MT532 | Shadow-Garlet-Water | 48,413 | 0.25 |
| MT538 | Skaggs-Starley-Raynesford | 25 | <0.01 |
| MT547 | Garlet-Stemple-Tigeron | 1,244 | 0.01 |
| MT550 | Sweetgrass-Hilger-Fairfield | 227,202 | 1.17 |
| MT555 | Tamaneen-Judith-Windham | 53,564 | 0.28 |
| MT559 | Tanna-Rentsac-Yawdim | 567,531 | 2.93 |
| MT569 | Yawdim-Thurlow-Cabbart | 116,568 | 0.6 |
| MT572 | Tigeron-Garlet-Worock | 142,349 | 0.74 |
| MT575 | Tinsley-Keiser-Yawdim | 141,874 | 0.73 |
| MT588 | Work-Turner-Wayden | 149,865 | 0.77 |
| MT590 | Twilight-Blackhall-Busby | 22,004 | 0.11 |
| MT594 | Vananda-Gerdrum-Mckenzie | 60,705 | 0.31 |
| MT597 | Vanstel-Cabbart-Delpoint | 72,598 | 0.38 |
| MT612 | Wanetta-Hesper-Bitton | 30,042 | 0.16 |
| MT617 | Wayden-Abac-Rock Outcrop | 91,333 | 0.47 |
| MT618 | Wayden-Regent-Doney | 82,113 | 0.42 |
| MT619 | Wayden-Eltsac-Maschetah | 186,591 | 0.96 |
| MT623 | Whitecow-Mocmont-Hughesville | 41,880 | 0.22 |

## TABLE SOI-1
## AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

| STATSGO Map Unit | Map Unit Name | Acres | Percent of Area |
|---|---|---|---|
| MT659 | Wormser-Lavina-Yawdim | 29,616 | 0.15 |
| MT661 | Worock-Garlet-Rock Outcrop | 3,050 | 0.02 |
| MT668 | Yamac-Havre-Birney | 211,006 | 1.09 |
| MT669 | Yamac-Kobar-Marvan | 22,214 | 0.11 |
| MT673 | Yawdim-Abor-Vananda | 179,618 | 0.93 |
| MT674 | Cabbart-Yawdim-Delpoint | 147,969 | 0.76 |
| MT675 | Cabbart-Yawdim-Thurlow | 758,425 | 3.92 |
| MT676 | Yawdim-Delpoint-Thurlow | 770,758 | 3.98 |
| MT677 | Yawdim-Delpoint-Gerdrum | 82,348 | 0.43 |
| MT678 | Yawdim-Ethridge-Rock Outcrop | 70,647 | 0.37 |
| MT679 | Cabbart-Yawdim-Hesper | 189,351 | 0.98 |
| MT680 | Yawdim-Orinoco-Amherst | 214,696 | 1.11 |
| MT690 | Welring-Clifterson-Shavano | 2,718 | 0.01 |
| MT691 | Ulm-Maggin-Louviers | 7,403 | 0.04 |
| MT692 | Shingle-Renohill-Ulm | 36,589 | 0.19 |
| MT693 | Samday-Shingle-Parmleed | 7,705 | 0.04 |
| MT694 | Orella-Epsie-Winler | 26,102 | 0.13 |
| MT695 | Haverdad-Havre-Zigweid | 14,472 | 0.07 |

Source: USDA NRSC State Soil Geographic Database 1996

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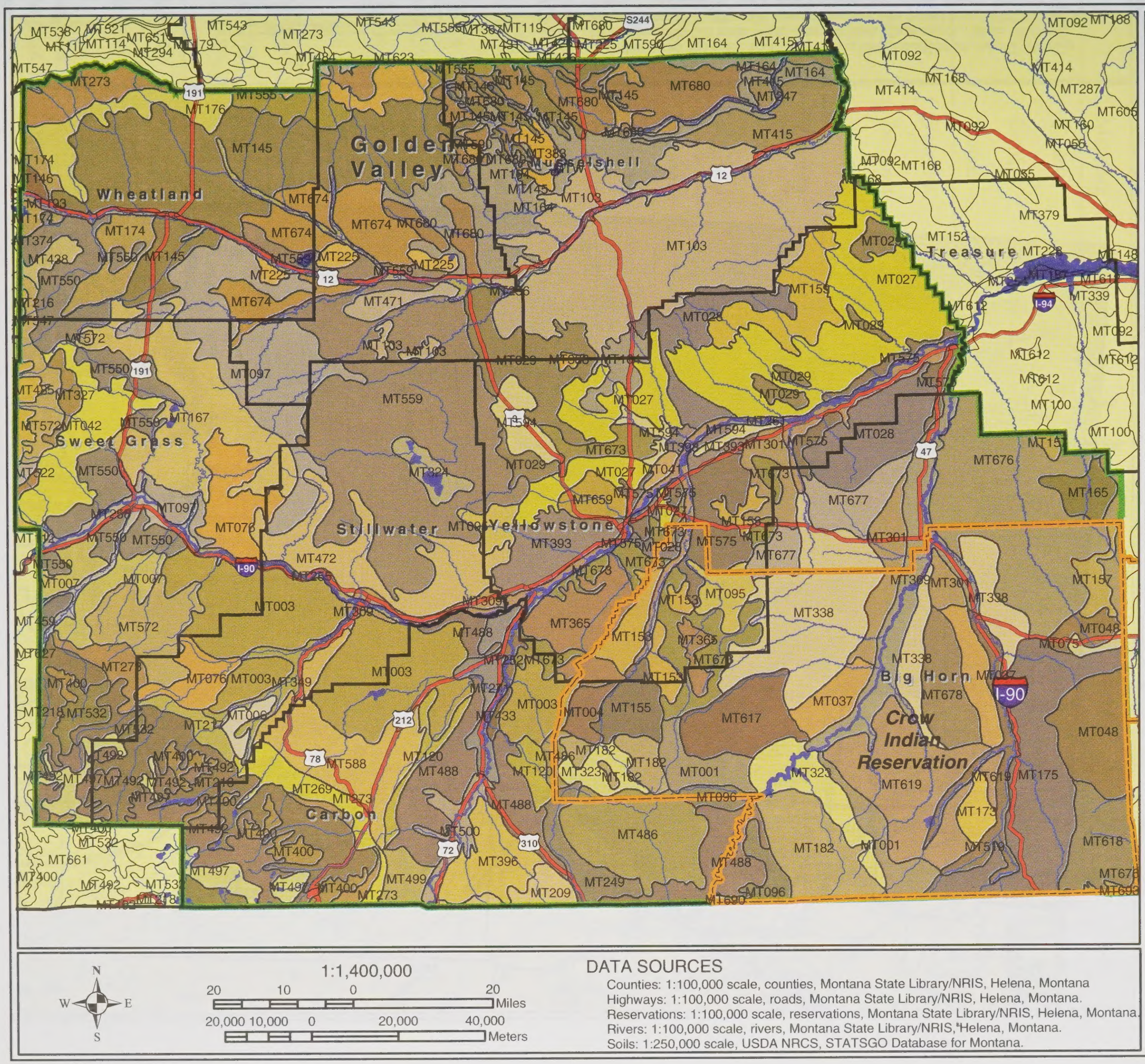
# Figure SOI-1: STATSGO Soils Types Billings RMP Area


Golden Valley
Musselshell
Wheatland
Treasure
Sweet Grass
Stillwater
Yellowstone
Big Horn
Carbon
Crow Indian Reservation
191
12
S244
I-94
47
I-90
212
78
72
310
N
W
E
S
1:1,400,000
20 10 0 20 Miles
20,000 10,000 0 20,000 40,000 Meters

DATA SOURCES
Counties: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana
Highways: 1:100,000 scale, roads, Montana State Library/NRIS, Helena, Montana.
Reservations: 1:100,000 scale, reservations, Montana State Library/NRIS, Helena, Montana.
Rivers: 1:100,000 scale, rivers, Montana State Library/NRIS, Helena, Montana.
Soils: 1:250,000 scale, USDA NRCS, STATSGO Database for Montana.

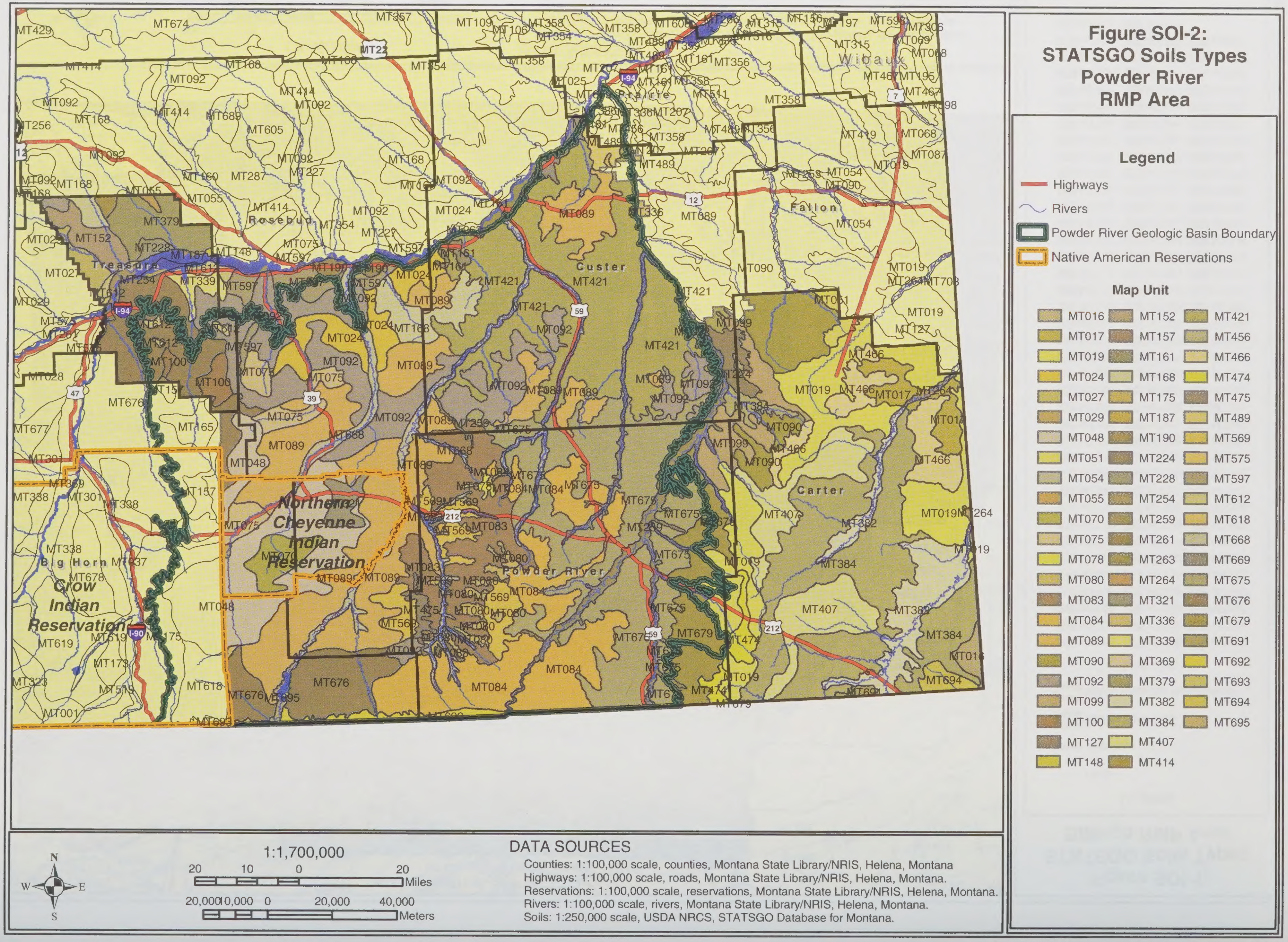
## Legend

— Rivers
— Highways
▭ Billings RMP Area
▭ Native American Reservations

### Map Unit

▨ MT001
▨ MT003
▨ MT004
▨ MT006
▨ MT007
▨ MT027
▨ MT028
▨ MT029
▨ MT037
▨ MT041
▨ MT042
▨ MT048
▨ MT075
▨ MT076
▨ MT092
▨ MT095
▨ MT096
▨ MT097
▨ MT100
▨ MT103
▨ MT112
▨ MT113
▨ MT114
▨ MT120
▨ MT145
▨ MT146
▨ MT152
▨ MT153
▨ MT155
▨ MT157
▨ MT159
▨ MT164
▨ MT165
▨ MT167
▨ MT168
▨ MT173
▨ MT174
▨ MT175
▨ MT176
▨ MT182
▨ MT193
▨ MT209
▨ MT213
▨ MT216
▨ MT217
▨ MT218
▨ MT225
▨ MT247
▨ MT249
▨ MT252
▨ MT255
▨ MT256
▨ MT258
▨ MT261
▨ MT269
▨ MT271
▨ MT273
▨ MT301
▨ MT309
▨ MT323
▨ MT324
▨ MT327
▨ MT338
▨ MT349
▨ MT365
▨ MT369
▨ MT374
▨ MT383
▨ MT393
▨ MT396
▨ MT400
▨ MT415
▨ MT433
▨ MT438
▨ MT459
▨ MT471
▨ MT472
▨ MT484
▨ MT485
▨ MT486
▨ MT488
▨ MT492
▨ MT497
▨ MT499
▨ MT500
▨ MT519
▨ MT522
▨ MT532
▨ MT538
▨ MT547
▨ MT550
▨ MT555
▨ MT559
▨ MT572
▨ MT575
▨ MT588
▨ MT590
▨ MT594
▨ MT617
▨ MT618
▨ MT619
▨ MT623
▨ MT659
▨ MT661
▨ MT673
▨ MT674
▨ MT676
▨ MT677
▨ MT678
▨ MT680
▨ MT690
▨ MT693
▨ MTW

## Figure SOI-2: STATSGO Soils Types Powder River RMP Area


Treasure
Rosebud
Custer
Prairie
Wibaux
Fallon
Carter
Powder River
Big Horn
Crow Indian Reservation
Northern Cheyenne Indian Reservation
Legend
Highways
Rivers
Powder River Geologic Basin Boundary
Native American Reservations
Map Unit
MT016
MT017
MT019
MT024
MT027
MT029
MT048
MT051
MT054
MT055
MT070
MT075
MT078
MT080
MT083
MT084
MT089
MT090
MT092
MT099
MT100
MT127
MT148
MT152
MT157
MT161
MT168
MT175
MT187
MT190
MT224
MT228
MT254
MT259
MT261
MT263
MT264
MT321
MT336
MT339
MT369
MT379
MT382
MT384
MT407
MT414
MT421
MT456
MT466
MT474
MT475
MT489
MT569
MT575
MT597
MT612
MT618
MT668
MT669
MT675
MT676
MT679
MT691
MT692
MT693
MT694
MT695
N
W
E
S
1:1,700,000
20 10 0 20 Miles
20,000 10,000 0 20,000 40,000 Meters

DATA SOURCES

Counties: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana
Highways: 1:100,000 scale, roads, Montana State Library/NRIS, Helena, Montana.
Reservations: 1:100,000 scale, reservations, Montana State Library/NRIS, Helena, Montana.
Rivers: 1:100,000 scale, rivers, Montana State Library/NRIS, Helena, Montana.
Soils: 1:250,000 scale, USDA NRCS, STATSGO Database for Montana.

## TABLE SOI-2
## SOIL SERIES CHARACTERISTICS FOR POWDER RIVER & BILLINGS RMP AREAS

| STATSGO Map Unit | Major Soil Series | Surface Texture | K-factor[1] | Depth (in) | Slope (%) | Salinity[2] (mmhos/cm) | Permeability (in/hr) |
|---|---|---|---|---|---|---|---|
| MT421 | Cambeth | silt loam | 0.37 | 6 | 4-25 | | 0.6-0.2 |
| (4.3 %) | Megonot | silty clay loam | 0.37 | 5 | 4-15 | | 0.06-0.2 |
| | Manning | loam | 0.32 | 5 | 8-15 | | 2-6 |
| MT089 | Cabbart | loam | 0.37 | 3 | 15-70 | 0-4 | 0.6-0.2 |
| (4.3 %) | Birney | channery-loam | 0.2 | 5 | 25-70 | 0-2 | 0.6-0.2 |
| | Yamac | loam | 0.37 | 5 | 15-25 | | 0.6-0.2 |
| MT676 | Yawdim | silty clay loam | 0.37 | 3 | 8-35 | | 0.2-0.6 |
| (4.0 %) | Delpoint | loam | 0.37 | 3 | 8-35 | 0-4 | 0.6-2 |
| | Thurlow | silty clay loam | 0.32 | 4 | 0-8 | | 0.6-2 |
| MT675 | Yawdim | clay loam | 0.37 | 3 | 8-70 | | 0.2-0.6 |
| (3.9 %) | Cabbart | silt loam | 0.37 | 3 | 15-75 | 0-4 | 0.2-0.6 |
| | Thurlow | silty clay loam | 0.32 | 4 | 2-15 | | 0.2-0.6 |
| MT384 | Marvan | silty clay | 0.37 | 4 | 0-8 | 0-4 | 0.06-0.2 |
| (3.5 %) | Neldore | clay | 0.32 | 3 | 4-15 | 0-2 | 0.06-0.2 |
| | Bascovy | clay | 0.37 | 6 | 2-15 | 2-4 | 0.06-0.2 |
| MT103 | Cabbart | loam | 0.37 | 3 | 6-45 | 0-4 | 0.6-2 |
| (3.0 %) | Delpoint | loam | 0.37 | 3 | 15-35 | 0-4 | 0.6-2 |
| | Yamac | loam | 0.37 | 5 | 2-8 | | 0.6-2 |
| MT559 | Tanna | clay loam | 0.37 | 6 | 2-8 | | 0.06-0.2 |
| (2.9 %) | Rentsac | channery-loam | 0.2 | 7 | 4-15 | | 0.6-2 |
| | Yawdim | clay loam | 0.37 | 3 | 25-60 | | 0.2-0.6 |
| MT092 | Cabbart | loam | 0.37 | 3 | 8-70 | 0-4 | 0.6-2 |
| (2.9 %) | Delpoint | loam | 0.37 | 3 | 15-25 | 0-4 | 0.6-2 |
| | Yamac | loam | 0.37 | 5 | 2-8 | | 0.6-2 |
| MT145 | Crago | loam | 0.37 | 4 | 0-4 | | 0.6-2 |
| (2.8%) | Musselshell | loam | 0.37 | 3 | 0-2 | | 0.6-2 |
| | Attewan | loam | 0.37 | 6 | 0-2 | | 0.6-2 |
| MT084 | Cabba | silt loam | 0.37 | 3 | 15-50 | 0-4 | 0.6-2 |

## TABLE SOI-2
SOIL SERIES CHARACTERISTICS FOR POWDER RIVER & BILLINGS RMP AREAS

| STATSGO Map Unit | Major Soil Series | Surface Texture | K-factor[1] | Depth (in) | Slope (%) | Salinity[2] (mmhos/cm) | Permeability (in/hr) |
|---|---|---|---|---|---|---|---|
| (2.6 %) | Ringling | slaty-loam | 0.17 | 5 | 5-50 | | 0.6-2 |
| | Yawdim | clay loam | 0.37 | 3 | 8-70 | | 0.2-0.6 |
| MT019 | Assinniboine | sandy clay loam | 0.32 | 6 | 2-8 | | 0.6-2 |
| (2.4 %) | Pring | sandy loam | 0.2 | 10 | 2-8 | | 2-6 |
| | Archin | loam | 0.43 | 12 | 2-8 | 0-2 | 0.6-2 |
| MT027 | Bainville | loam | 0.37 | 4 | 2-15 | | 0.6-2 |
| (2.4 %) | Rock Outcrop | unweathered bedrock | 0 | 60 | 25-60 | | 0.6-2 |
| | Mcrae | loam | 0.37 | 5 | 7-15 | 0-2 | 0.6-2 |
| MT003 | Absarokee | clay loam | 0.32 | 8 | 2-50 | 0-2 | 0.6-2 |
| (2.3 %) | Castner | channery-loam | 0.2 | 6 | 15-50 | | 0.6-2 |
| | Sinnigam | clay loam | 0.37 | 6 | 2-15 | | 0.06-0.2 |
| MT048 | Bitton | channery-loam | 0.24 | 11 | 25-70 | 0-2 | 2-6 |
| (2.2 %) | Shambo | loam | 0.37 | 5 | 0-8 | | 0.6-2 |
| | Doney | loam | 0.37 | 4 | 2-70 | 0-2 | 0.6-2 |
| MT338 | Lisam | clay | 0.37 | 3 | 4-35 | 0-2 | 0.06-0.2 |
| (1.6 %) | Abor | clay | 0.37 | 6 | 4-15 | 0-4 | 0.2-0.6 |
| | Vanda | clay | 0.37 | 4 | 0-8 | 2-8 | 0.01-0.06 |
| MT083 | Cabba | silt loam | 0.37 | 3 | 15-50 | 0-4 | 0.6-2 |
| (1.6 %) | Ringling | slaty-loam | 0.17 | 5 | 6-50 | | 0.6-2 |
| | Yawdim | clay loam | 0.37 | 3 | 8-70 | | 0.2-0.6 |
| MT097 | Cabbart | loam | 0.37 | 3 | 8-35 | 0-4 | 0.6-2 |
| (1.5 %) | Rentsac | channery-loam | 0.2 | 7 | 8-35 | | 2-6 |
| | Delpoint | loam | 0.37 | 3 | 8-15 | 0-4 | 0.6-2 |
| MT164 | Delpoint | loam | 0.37 | 3 | 2-15 | 0-4 | 0.6-2 |
| (1.4 %) | Cabbart | loam | 0.37 | 3 | 2-35 | 0-4 | 0.6-2 |
| | Yamac | Loam | 0.37 | 5 | 2-15 | | 0.6-2 |
| MT218 | Shadow | stony-loam | 0.1 | 3 | 25-60 | | 2-6 |
| (1.3 %) | Macfarlane | very stony-loam | 0.05 | 18 | 25-50 | | 2-6 |

### TABLE SOI-2
### SOIL SERIES CHARACTERISTICS FOR POWDER RIVER & BILLINGS RMP AREAS

| STATSGO Map Unit | Major Soil Series | Surface Texture | K-factor[1] | Depth (in) | Slope (%) | Salinity[2] (mmhos/cm) | Permeability (in/hr) |
|---|---|---|---|---|---|---|---|
| | Garlet | stony-loam | 0.2 | 4 | 25-60 | | 0.6-2 |
| MT407 | Moyerson | silty clay loam | 0.32 | 4 | 4-50 | 0-4 | 0.06-0.2 |
| (1.3 %) | Orinoco | silty clay loam | 0.32 | 7 | 2-15 | | 0.2-0.6 |
| | Rock Outcrop | unweathered bedrock | 0 | 60 | 0-99 | | 0.2-0.6 |
| MT488 | Midway | silty clay loam | 0.43 | 3 | 15-45 | 2-4 | 0.2-0.6 |
| (1.2 %) | Travessilla Family | silt loam | 0.32 | 2 | 15-70 | | 0.6-2 |
| | Rock Outcrop | unweathered bedrock | 0 | 60 | 0-99 | | 0.6-2 |
| MT175 | Doney | loam | 0.37 | 4 | 8-70 | 0-2 | 0.6-2 |
| (1.2 %) | Wayden | silty clay loam | 0.37 | 6 | 8-35 | 0-4 | 0.6-2 |
| | Shaak | clay loam | 0.37 | 6 | 1-15 | | 0.06-0.2 |
| MT550 | Sweetgrass | cobbly-clay loam | 0.17 | 4 | 0-4 | | 0.6-2 |
| (1.2 %) | Hilger | cobbly-loam | 0.2 | 5 | 2-4 | | 0.6-2 |
| | Fairfield | gravelly-clay | 0.17 | 7 | 2-4 | | 0.6-2 |
| MT167 | Travessilla Family | fine sandy loam | 0.2 | 2 | 8-35 | | 2-6 |
| (1.1 %) | Delpoint | loam | 0.37 | 3 | 8-15 | 0-4 | 0.6-2 |
| | Cabbart | loam | 0.37 | 3 | 8-35 | 0-4 | 0.6-2 |
| MT680 | Yawdim | silty clay | 0.32 | 3 | 4-15 | | 0.06-0.2 |
| (1.1 %) | Orinoco | silty clay | 0.28 | 7 | 4-15 | | 0.2-0.6 |
| | Amherst | clay loam | 0.32 | 5 | 1-15 | | 0.6-2 |
| MT668 | Yamac | loam | 0.37 | 5 | 0-8 | | 0.6-2 |
| (1.1 %) | Havre | silty clay loam | 0.32 | 8 | 0-2 | 0-2 | 0.2-0.6 |
| | Birney | channery-loam | 0.2 | 5 | 15-35 | 0-2 | 0.6-2 |

Source: USDA NRCS State Soil Geographic Database 1996

Note: Only the top 25 Map Units based on total acreage are included (percent in parenthesis). 58 percent of the soils in the study area are represented.

[1] Soil erosion factor indicates the susceptibility of a soil to sheet and rill erosion. Possible range of values is from 0.02 to 0.69, with higher values being more susceptible to erosion.

[2] Measure of the amount of soluble salts in a soil at saturation, also expressed as electrical conductivity (EC).

# SOLID AND HAZARDOUS WASTE APPENDIX

# SOLID AND HAZARDOUS WASTE APPENDIX

The Toxics Release Inventory (TRI) provides state reports about releases and transfers of chemicals and compounds. Each report contains overall state information regarding releases and transfers, a list of the top five chemicals released or transferred, off-site, in that state, and a list of the top ten facilities that released or transferred, off-site, the greatest amount of chemicals. All chemical and facility information was taken directly from the Envirofacts TRI database maintained by the U.S. Environmental Protection Agency (EPA).

## TRI State Report Descriptions

This is a brief description of the TRI State Reports. A brief explanation of each column heading is given.

### State Information

This is general TRI information relating to the state.

- Total Facilities—The total facilities reporting in that state.
- Total Forms—The total number of forms submitted. Each form has a unique Document Control Number.
- Total Forms A's—The total number of short forms submitted.
- Transfer into State—The total amount of waste chemicals (in pounds) transferred into the state.
- Transfer out of State—The total amount of waste chemicals (in pounds) transferred out of the state.
- Population—The population of a state as reported by the U.S. Census Bureau for 1990.

### Reported Releases and Waste Management Activities

#### On-Site Releases

The amount of chemicals released as reported by facilities in that state.

- Air Emissions—Total on-site releases of a particular type in pounds where the environmental medium = 'AIR'.
- Surface Water Discharges—Total on-site releases of a particular type in pounds where the environmental medium = 'WATER'.
- Underground Injection—Total on-site releases of a particular type in pounds where the environmental medium = 'UNINJ I' or 'UNINJ IIV'.
  - Class I Wells—Total on-site releases of a particular type in pounds where the environmental medium = 'UNINJ I'.
  - Class II-V Wells—Total on-site releases of a particular type in pounds where the environmental medium = 'UNINJ IIV'.
- Releases to Land—Total on-site releases of a particular type in pounds where the environmental medium = 'RCRA C' or 'OTH LANDF'.
  - RCRA Subtitle C Landfills—Total on-site releases of a particular type in pounds where the environmental medium = 'RCRA C'.
  - Other On-Site Land Releases—Total on-site releases of a particular type in pounds where the environmental medium = 'OTH LANDF'.

- Total On-Site Releases—The sum of Air Emissions, Surfaces Water Discharges, Underground Injection, and Releases to Land.
- Transfer Off-Site to Disposal—Total off-site transfer of a particular type in pounds for disposal.
- Total On and Off-Site Releases—Sum of total on-site releases and off-site transfers.

## Off-Site Releases (Transfers Off-Site to Disposal)

- POTWs (metals and metal compounds)—Total transfer of metals and metal compounds in pounds to POTWs as offsite releases.
- Transfer Off-Site to Disposal—Total off-site transfer of a particular type in pounds for disposal.
- Total Off-Site Releases—Sum of total POTW's (metals and metal compounds) and off-site transfers to disposals.
- Total Releases—Sum of total on-site and off-site releases.

## Source Reduction Activities

- Energy Recovery On-Site—The total amount of the toxic chemical in waste burned for energy recovery onsite, reported in section 8.2 of Form R.
- Energy Recovery Off-Site—The total amount of the toxic chemical in waste sent offsite to be burned for energy recovery, reported in section 8.3 of Form R.
- Recycling On-Site—The total amount of the toxic chemical recycled onsite, reported in section 8.4 of Form R.
- Recycling Off-Site—The total amount of the toxic chemical sent offsite for recycling, reported in section 8.5 of Form R.
- Treatment On-Site—The total amount of the toxic chemical treated onsite, reported in section 8.6 of Form R.
- Treatment Off-Site—The total amount of the toxic chemical treated offsite, reported in section 8.7 of Form R.
- Total Releases—The total amount of the toxic chemical released due to production related events by the facility to all environmental media both on and off site, reported in section 8.1 of Form R.
- Total Production Related Waste Managed—The sum of recycling, energy recovery, treatment, and total releases.

## Transfers Off-Site to POTW's

- Metals and Metal Compounds—Total transfer of metals and metals compounds in pounds to POTW's as an off-site releases.
- Non-Metal TRI Chemicals—Total off-site transfer of non-metals in pounds to a POTW's as an off-site release.
- Total Transfers Off-site to POTW's—Sum of total off-site transfers of Metals and Non-Metals to POTW's.

## Top Ten Chemicals for Air/Water/Land/Underground Injection Releases and the Top Ten Chemicals for Total On and Off-Site Releases

The waste chemicals that are most released into the environment for that state.

- Chemical—The name of the chemical.
- Air Emissions—Total on-site releases of a particular type in pounds where the environmental medium = 'AIR'.

- Surface Water Discharges—Total on-site releases of a particular type in pounds where the environmental medium = ‘WATER’.
- Underground Injection—Total on-site releases of a particular type in pounds where the environmental medium = ‘UNINJ I’ or ‘UNINJ IIV’.
  - Class I Wells—Total on-site releases of a particular type in pounds where the environmental medium = ‘UNINJ I’.
  - Class II-V Wells—Total on-site releases of a particular type in pounds where the environmental medium = ‘UNINJ IIV’.
- Releases to Lands—Total on-site releases of a particular type in pounds where the environmental medium = ‘RCRA C’ or ‘OTH LANDF’.
  - RCRA Subtitle C Landfills—Total on-site releases of a particular type in pounds where the environmental medium = ‘RCRA C’.
  - Other On-Site Land Release—Total on-site releases of a particular type in pounds where the environmental medium = ‘OTH LANDF’.
- Total On-site Releases—The sum of Air Emissions, Surfaces Water Discharges, Underground Injection, and Releases to Land.
- Transfers Off-Site to Disposal—Total off-site transfer of a particular type in pounds for disposal.
- Total On and Off-site Releases—Sum of total on-site releases and off-site transfers.

## Top Ten Facilities for Air/Water/Land/Underground Injection Releases and the Top Ten Facilities for Total On and Off-site Release

The facilities that release the most waste chemicals into the environment for that state.

- Facility—The name of the facility.
- City, County—The city name and the county name where the facility is located.
- Air Emissions—Total on-site releases in pounds by a facility where the environmental medium = ‘AIR’.
- Surface Water Discharge—Total on-site releases in pounds by a facility where the environmental medium = ‘WATER’.

- Underground Injection—Total on-site releases in pounds by a facility where the environmental medium = 'UNINJ I' or 'UNINJ IIV'.
  - Class I Wells—Total on-site releases in pounds by a facility where the environmental medium = 'UNINJ I'.
  - Class II-V Wells—Total on-site releases in pounds by a facility where the environmental medium = 'UNINJ IIV'.
- Releases to Land—Total on-site releases in pounds by a facility where the environmental medium = 'RCRA C' or 'OTH LANDF'.
  - RCRA Subtitle C Landfills—Total on-site releases in pounds by a facility where the environmental medium = 'RCRA C'.
  - Other On-Site Land Releases—Total on-site releases in pounds by a facility where the environmental medium = 'OTH LANDF'.
- Total On-site Releases—The sum of Air Emissions, Surfaces Water Discharges, Underground Injection, and Releases to Land by a facility.
- Transfers Off-Site to Disposal—Total off-site transfer in pounds for disposal by a facility.
- Total On and Off-site Releases—Sum of total on-site releases and off-site transfers by a facility.

# 1999 Toxics Release Inventory

# MONTANA

## Reported Releases and Waste Management Activities (in pounds)

| | Original Industries | New Industries | Total |
|---|---|---|---|
| On-site Releases | 48,545,330 | 78,582,271 | 127,127,601 |
| Air Emissions | 5,368,777 | 1,152,322 | 6,521,099 |
| Surface Water Discharges | 36,047 | 10 | 36,057 |
| Underground Injection Class I Wells | 0 | 0 | 0 |
| Underground Injection Class II-V Wells | 0 | 0 | 0 |
| On-site Land Releases to RCRA Subtitle C Landfills | 2,298 | 0 | 2,298 |
| Other On-site Land Releases | 43,138,208 | 77,429,939 | 120,568,147 |
| Off-site Releases (Transfers Off-site to Disposal)* | 114,245 | 376,802 | 491,047 |
| **Total On- and Off-site Releases** | 48,659,575 | 78,959,073 | 127,618,648 |
| Recycled On-site | 36,466,718 | 0 | 36,466,718 |
| Recycled Off-site | 180,530 | 33,753 | 214,283 |
| Energy Recovery On-site | 7,559,811 | 0 | 7,559,811 |
| Energy Recovery Off-site | 22,434 | 0 | 22,434 |
| Treated On-site | 7,916,220 | 2,893,460 | 10,809,680 |
| Treated Off-site** | 30,689 | 1,439 | 32,128 |
| Quantity Released On- and Off-site*** | 49,842,158 | 78,950,223 | 128,792,381 |
| **Total Production-related Waste Managed** | 102,018,560 | 81,878,875 | 183,897,435 |
| **Total Non-production-related Waste Managed** | 6,898 | 17 | 6,915 |

## Transfers Off-site for Further Waste Management/Disposal

| | Original Industries | New Industries | Total |
|---|---|---|---|
| Recycling | 232,658 | 6,753 | 239,411 |
| Energy Recovery | 23,611 | 0 | 23,611 |
| Treatment | 23,412 | 1,689 | 25,101 |
| Publicly Owned Treatment Works (POTWs) | 11,285 | 0 | 11,285 |
| Metals and Metal Compounds* | 10 | 0 | 10 |
| Non-metal TRI Chemicals** | 11,275 | 0 | 11,275 |
| Other Off-site Transfers**** | 0 | 0 | 0 |
| Off-site Transfers to Disposal *(not including metals to POTWs)* | 1,368,210 | 376,802 | 1,745,012 |
| **Total Transfers Off-site for Further Waste Management/Disposal** | 1,659,176 | 385,244 | 2,044,420 |

* Transfers to POTWs of metals and metal compounds are included in off-site releases. Excludes transfer amounts sent for disposal to other TRI facilities reporting that amount released on-site.

** Transfers to POTWs of non-metals are included in treated off-site waste management activity.

*** Excludes non-production-related releases; e.g. releases due to catastrophic events or remedial actions.

****Transfers reported without a valid waste management code.

## For More Information . . .

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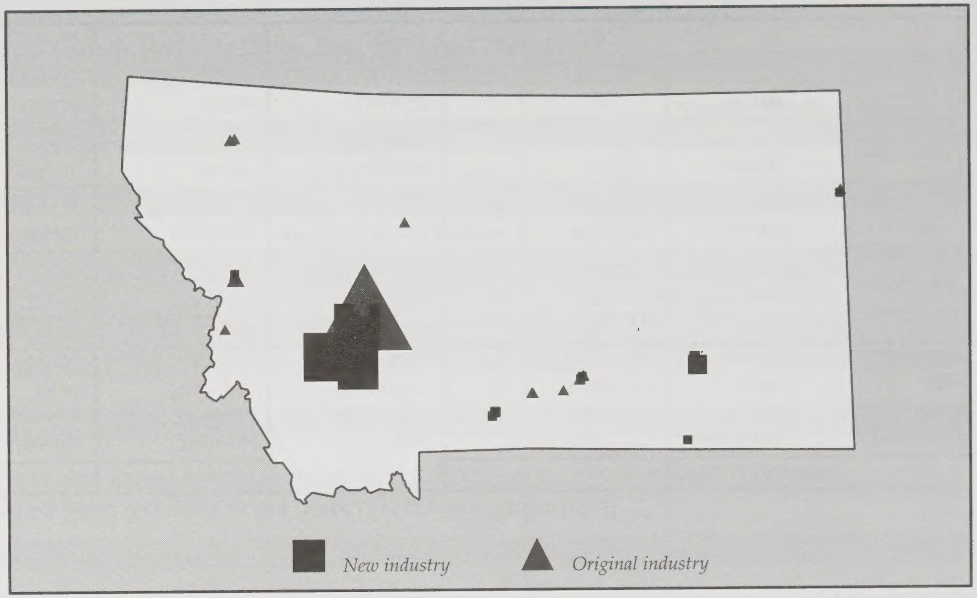
**To obtain TRI data use assistance, call TRI User Support Service (TRI-US):**
(202) 260-1531
Fax: (202) 401-2347



The largest marker in the state map represents the largest facility for on-site releases in the state of Montana. All markers are proportionally-sized to represent the on-site releases at each facility within this state.

## State/TRI Data

| | |
|---|---|
| Population | 882,779 |
| Square Miles | 145,556 |
| Total Facilities | 42 |
| Total Forms | 253 |
| Form As | 31 |

| | Original Industries | New Industries | Total |
|---|---|---|---|
| **National Rank for Total On- and Off-site Releases*** | | | |
| Rank | 19 | 9 | 18 |
| Pounds | 48,659,575 | 78,959,073 | 127,618,648 |
| **National Rank for Total On-site Releases**** | | | |
| Rank | 17 | 9 | 16 |
| Pounds | 48,545,330 | 78,582,271 | 127,127,601 |
| **National Rank for Total Releases within State***** | | | |
| Rank | 20 | 9 | 18 |
| Pounds | 48,552,624 | 78,959,071 | 127,511,695 |
| **National Rank for Production-related Waste Managed** | | | |
| Rank | 34 | 19 | 34 |
| Pounds | 102,018,560 | 81,878,875 | 183,897,435 |

* Includes transfers out-of-state for disposal. Excludes transfer amounts sent for disposal to other TRI facilities reporting that amount released on-site.

** Includes amounts released at the facility. Excludes amounts transferred to other sites.

*** Excludes transfers for disposal sent out-of-state or sent to other TRI facilities within the state reporting that amount released on-site.

## On-site and Off-site Releases for Top Ten Chemicals Ranked on Total Releases in the State (Original Industries)

| | | On-site Releases | | | | Off-site Releases | | Off-site Transfers to Disposal | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CAS Number | Chemical | Air Emissions Pounds | Surface Water Discharges Pounds | Underground Injection Pounds | On-site Releases to Land Pounds | Transfers Off-site to Disposal* Pounds | Total Releases in the State** Pounds | Transferred Into State Pounds | Transferred Within State Pounds | Transferred Out of State Pounds |
| -- | Zinc compounds | 10,562 | 43 | 0 | 35,577,360 | 345,316 | 35,933,281 | 0 | 5 | 345,311 |
| -- | Lead compounds | 16,454 | 1 | 0 | 2,554,272 | 580,236 | 3,150,963 | 0 | 0 | 580,236 |
| 67-56-1 | Methanol | 3,088,962 | 16,000 | 0 | 270 | 0 | 3,105,232 | 0 | 0 | 0 |
| -- | Manganese compounds | 786 | 3 | 0 | 2,976,183 | 10,839 | 2,987,811 | 0 | 0 | 10,839 |
| -- | Copper compounds | 8,519 | 7 | 0 | 1,444,304 | 15,697 | 1,468,527 | 0 | 5 | 15,692 |
| 7664-41-7 | Ammonia | 781,138 | 13,430 | 0 | 14,105 | 436 | 809,109 | 0 | 0 | 436 |
| 50-00-0 | Formaldehyde | 465,261 | 2,800 | 0 | 0 | 0 | 468,061 | 0 | 0 | 0 |
| -- | Cadmium compounds | 1,241 | 1 | 0 | 11,403 | 359,346 | 371,991 | 0 | 0 | 359,346 |
| -- | Arsenic compounds | 2,788 | 63 | 0 | 281,882 | 34,971 | 319,704 | 0 | 0 | 34,971 |
| 7664-39-3 | Hydrogen fluoride | 228,730 | 0 | 0 | 0 | 0 | 228,730 | 0 | 0 | 0 |

* Excludes amounts transferred to other TRI facilities in the state reporting that amount released on-site.

** The chemical ranking is based on the amounts in this column.

## On-site and Off-site Releases for Top Ten Chemicals Ranked on Total Releases in the State (Seven New Industries)

| | | On-site Releases | | | | Off-site Releases | | Off-site Transfers to Disposal | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CAS Number | Chemical | Air Emissions Pounds | Surface Water Discharges Pounds | Underground Injection Pounds | On-site Releases to Land Pounds | Transfers Off-site to Disposal* Pounds | Total Releases in the State** Pounds | Transferred Into State Pounds | Transferred Within State Pounds | Transferred Out of State Pounds |
| -- | Zinc compounds | 4,904 | 0 | 0 | 21,405,495 | 3,900 | 21,414,299 | 0 | 3,900 | 0 |
| -- | Copper compounds | 2,687 | 0 | 0 | 15,177,982 | 3,900 | 15,184,569 | 0 | 3,900 | 0 |
| 7440-50-8 | Copper | 1,213 | 0 | 0 | 11,103,779 | 0 | 11,104,992 | 0 | 0 | 0 |
| -- | Lead compounds | 1,260 | 0 | 0 | 10,749,000 | 1,601 | 10,751,861 | 0 | 1,600 | 1 |
| 7440-47-3 | Chromium | 581 | 0 | 0 | 7,461,120 | 0 | 7,461,701 | 0 | 0 | 0 |
| -- | Barium compounds | 109,987 | 5 | 0 | 3,995,701 | 145,600 | 4,251,293 | 0 | 145,600 | 0 |
| 7440-02-0 | Nickel | 810 | 0 | 0 | 2,280,350 | 0 | 2,281,160 | 0 | 0 | 0 |
| -- | Manganese compounds | 10,898 | 5 | 0 | 1,734,026 | 67,700 | 1,812,629 | 0 | 67,700 | 0 |
| -- | Arsenic compounds | 500 | 0 | 0 | 1,530,000 | 1,250 | 1,531,750 | 0 | 1,250 | 0 |
| 7647-01-0 | Hydrochloric acid | 579,916 | 0 | 0 | 0 | 0 | 579,916 | 0 | 0 | 0 |

* Excludes amounts transferred to other TRI facilities in the state reporting that amount released on-site.

** The chemical ranking is based on the amounts in this column.

# 1999 Toxics Release Inventory

# MONTANA

## On- and Off-site Releases for Top Ten Facilities Ranked on Total On-site Releases in the State (Original Industries)

| Facility, City, County | On-site Releases | | | | | | Total On-site Releases* Pounds | Off-site Releases (Transfers Off-site to Disposal) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Underground Injection | | On-site Releases to Land | | | | |
| | Air Emissions Pounds | Surface Water Discharges Pounds | Class I Wells Pounds | Class II-V Wells Pounds | RCRA Subtitle C Landfills Pounds | Other On-site Land Releases Pounds | | Transferred Within State Pounds | Transferred Out of State Pounds |
| ASARCO Inc., East Helena, Lewis and Clark | 50,525 | 1,660 | 0 | 0 | 0 | 43,058,183 | 43,110,368 | 0 | 1,350,974 |
| Stone Container Corp., Missoula, Missoula | 3,298,705 | 24,400 | 0 | 0 | 0 | 285 | 3,323,390 | 0 | 0 |
| Plum Creek MDF Inc., Columbia Falls, Flathead | 741,550 | 0 | 0 | 0 | 0 | 0 | 741,550 | 0 | 0 |
| Columbia Falls Aluminum Co. L.L.C., Columbia Falls, Flathead | 300,197 | 0 | 0 | 0 | 0 | 81 | 300,278 | 0 | 0 |
| Holly Sugar Corp., Sidney, Richland | 239,000 | 0 | 0 | 0 | 0 | 10,000 | 249,000 | 0 | 0 |
| Louisiana-Pacific Corp. Missoula Particleboard, Missoula, Missoula | 166,000 | 0 | 0 | 0 | 0 | 0 | 166,000 | 0 | 0 |
| Conoco Inc. Billings Refy., Billings, Yellowstone | 129,508 | 616 | 0 | 0 | 0 | 0 | 130,124 | 0 | 0 |
| Western Sugar Co.130130, Billings, Yellowstone | 64,000 | 3,400 | 0 | 0 | 0 | 42,100 | 109,500 | 0 | 0 |
| ExxonMobil Billings Refy., Billings, Yellowstone | 100,867 | 5,686 | 0 | 0 | 0 | 9 | 106,562 | 44 | 4,013 |
| Montana Refining Co., Great Falls, Cascade | 75,755 | 0 | 0 | 0 | 0 | 0 | 75,755 | 0 | 0 |

*The facility ranking is based on the amounts in this column; these quantities exclude transfers out of state.

## On- and Off-site Releases for Top Ten Facilities Ranked on Total On-site Releases in the State (Seven New Industries)

| Facility, City, County | On-site Releases | | | | | | Total On-site Releases* Pounds | Off-site Releases (Transfers Off-site to Disposal) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Underground Injection | | On-site Releases to Land | | | | |
| | Air Emissions Pounds | Surface Water Discharges Pounds | Class I Wells Pounds | Class II-V Wells Pounds | RCRA Subtitle C Landfills Pounds | Other On-site Land Releases Pounds | | Transferred Within State Pounds | Transferred Out of State Pounds |
| Montana Resources, Butte, Silver Bow | 1,000 | 0 | 0 | 0 | 0 | 25,082,000 | 25,083,000 | 0 | 0 |
| Montana Tunnels Mining Inc., Jefferson City, Jefferson | 28,014 | 0 | 0 | 0 | 0 | 24,082,370 | 24,110,384 | 0 | 0 |
| Golden Sunlight Mines Inc., Whitehall, Jefferson | 111,632 | 0 | 0 | 0 | 0 | 20,376,450 | 20,488,082 | 0 | 0 |
| PP&L Montana Colstrip Steam Electric Station, Colstrip, Rosebud | 285,185 | 0 | 0 | 0 | 0 | 6,293,900 | 6,579,085 | 156,500 | 2 |
| SMC Nye Mine Site, Nye, Stillwater | 1,101 | 0 | 0 | 0 | 0 | 963,225 | 964,326 | 0 | 0 |
| Colstrip Energy L.P. Rosebud Power Plant, Colstrip, Rosebud | 613,223 | 0 | 0 | 0 | 0 | 344,454 | 957,677 | 0 | 0 |
| SMC East Boulder Project, Mc Leod, Sweet Grass | 0 | 0 | 0 | 0 | 0 | 249,523 | 249,523 | 0 | 0 |
| J.E. Corette Steam Electric Station, Billings, Yellowstone | 62,350 | 10 | 0 | 0 | 0 | 0 | 62,360 | 80,000 | 0 |
| Lewis & Clark Station, Sidney, Richland | 25,196 | 0 | 0 | 0 | 0 | 25,800 | 50,996 | 140,300 | 0 |
| Conoco Helena Product Terminal, Helena, Lewis and Clark | 13,109 | 0 | 0 | 0 | 0 | 0 | 13,109 | 0 | 0 |

*The facility ranking is based on the amounts in this column; these quantities exclude transfers out of state.

### Total Production-related Waste for Top Ten Facilities Ranked on Quantity Released On- and Off-site (Original Industries)

| Facility, City, County | Recycled On-site Pounds | Recycled Off-site Pounds | Energy Recovery On-site Pounds | Energy Recovery Off-site Pounds | Treated On-site Pounds | Treated Off-site Pounds | Quantity Released On- and Off-site* Pounds | Total Production-related Waste Managed Pounds | Total Non-production-related Waste Managed Pounds |
|---|---|---|---|---|---|---|---|---|---|
| ASARCO Inc., East Helena, Lewis and Clark | 28,916,883 | 0 | 0 | 0 | 0 | 0 | 44,454,865 | 73,371,748 | 6,467 |
| Stone Container Corp., Missoula, Missoula | 0 | 0 | 7,084,400 | 0 | 4,153,500 | 0 | 3,305,754 | 14,543,654 | 0 |
| Plum Creek MDF Inc., Columbia Falls, Flathead | 0 | 0 | 0 | 0 | 0 | 0 | 740,300 | 740,300 | 0 |
| Columbia Falls Aluminum Co. L.L.C., Columbia Falls, Flathead | 6,342,848 | 0 | 0 | 0 | 0 | 0 | 300,278 | 6,643,126 | 0 |
| Holly Sugar Corp., Sidney, Richland | 0 | 0 | 0 | 0 | 0 | 0 | 249,000 | 249,000 | 0 |
| Louisiana-Pacific Corp. Missoula Particleboard, Missoula, Missoula | 0 | 0 | 0 | 3,700 | 0 | 0 | 166,000 | 169,700 | 0 |
| Conoco Inc. Billings Refy., Billings, Yellowstone | 0 | 26,923 | 0 | 24 | 68,890 | 4 | 118,990 | 214,831 | 0 |
| ExxonMobil Billings Refy., Billings, Yellowstone | 0 | 12,000 | 250,000 | 0 | 2,298,877 | 209 | 110,812 | 2,671,898 | 6 |
| Western Sugar Co.130130, Billings, Yellowstone | 0 | 0 | 0 | 0 | 4,000 | 0 | 105,000 | 109,000 | 0 |
| Montana Refining Co., Great Falls, Cascade | 216,100 | 0 | 0 | 0 | 0 | 11,079 | 76,440 | 303,619 | 0 |

*The facility ranking is based on the amounts in this column; these quantities exclude non-production-related releases.

### Total Production-related Waste for Top Ten Facilities Ranked on Quantity Released On- and Off-site (Seven New Industries)

| Facility, City, County | Recycled On-site Pounds | Recycled Off-site Pounds | Energy Recovery On-site Pounds | Energy Recovery Off-site Pounds | Treated On-site Pounds | Treated Off-site Pounds | Quantity Released On- and Off-site* Pounds | Total Production-related Waste Managed Pounds | Total Non-production-related Waste Managed Pounds |
|---|---|---|---|---|---|---|---|---|---|
| Montana Resources, Butte, Silver Bow | 0 | 0 | 0 | 0 | 0 | 0 | 25,066,200 | 25,066,200 | 0 |
| Montana Tunnels Mining Inc., Jefferson City, Jefferson | 0 | 27,000 | 0 | 0 | 0 | 0 | 24,110,370 | 24,137,370 | 7 |
| Golden Sunlight Mines Inc., Whitehall, Jefferson | 0 | 0 | 0 | 0 | 0 | 0 | 20,424,110 | 20,424,110 | 5 |
| PP&L Montana Colstrip Steam Electric Station, Colstrip, Rosebud | 0 | 0 | 0 | 0 | 2,500,000 | 0 | 6,831,112 | 9,331,112 | 0 |
| Colstrip Energy L.P. Rosebud Power Plant, Colstrip, Rosebud | 0 | 0 | 0 | 0 | 0 | 0 | 957,677 | 957,677 | 0 |
| SMC Nye Mine Site, Nye, Stillwater | 0 | 0 | 0 | 0 | 20,460 | 0 | 943,866 | 964,326 | 0 |
| SMC East Boulder Project, Mc Leod, Sweet Grass | 0 | 0 | 0 | 0 | 0 | 0 | 249,523 | 249,523 | 0 |
| Lewis & Clark Station, Sidney, Richland | 0 | 0 | 0 | 0 | 238,000 | 0 | 191,040 | 429,040 | 4 |
| J.E. Corette Steam Electric Station, Billings, Yellowstone | 0 | 0 | 0 | 0 | 135,000 | 0 | 142,000 | 277,000 | 0 |
| Decker Coal Co., Decker, Big Horn | 0 | 6,753 | 0 | 0 | 0 | 0 | 12,217 | 18,970 | 1 |

*The facility ranking is based on the amounts in this column; these quantities exclude non-production-related releases.

# VEGETATION APPENDIX

# VEGETATION APPENDIX

## Habitat Types and Biological Diversity

The land classification system developed by the University of Montana, Montana Gap Analysis Project (MT-GAP), was used to estimate acreages listed for this Appendix (Fisher et al. 1998).

### Grasslands

Grasslands cover approximately 10.4 million acres of the 16-county planning area. Of this acreage, 3.5 million acres are underlain by subbituminous or bituminous coal deposits. Grasslands are divided into five types (see Table VEG-1). Species richness data for these types are provided.

**Altered herbaceous habitats** include grasslands with 30 percent or more cover from introduced species and/or noxious weed species such as thistle (*Cirsium* spp.), cheat grass (*Bromus tectorum*), Japanese brome (*B. japonicus*), spotted knapweed (*Centaurea maculosa*), crested wheatgrass (*Agropyron cristatum*) or yellow sweetclover (*Melilotus officinalis*). Total herbaceous cover ranges from 20 to 80 percent on these sites, which are usually associated with disturbance and can have bare ground coverages in the 10 to 50 percent range (Fisher et al. 1998).

**Very Low Cover Grasslands** are semi-desert grasslands with total grass cover of 10 to 30 percent. They are dominated by short grasses and forbs such as blue grama (*Bouteloua gracilis*). These grasslands typically have a high amount of bare soil (20 to 60 percent) (Fisher et al. 1998).

**Low to Moderate Cover Grasslands** are the most abundant grassland type in Montana. They are the category that has the greatest potential for impact from CBM extraction (see Table VEG-1). Total grass coverages on these sites range from 20 to 70 percent and are dominated by short- to medium-height grasses and forbs, such as blue grama, green needlegrass (*Stipa viridula*), Idaho fescue (*Festuca idahoensis*), lupine (*Lupinus* spp.), arrowleaf balsamroot (*Balsamorhiza sagittata*), and bluebunch wheatgrass (*Agropyron spicatum*) (Fisher et al. 1998).

**Moderate to High Cover Grasslands** are dominated by medium to tall grass species, such as bluebunch wheatgrass, green needlegrass, big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), little bluestem (*Andropogon scoparium*), and needle and thread (*Stipa comata*). Grass coverage on these grasslands ranges from 50 to 100 percent (Fisher et al. 1998).

**Montane Parklands and Subalpine Meadows** are the final type of grasslands classification for Montana lands. Total herbaceous cover in these moist locations can range from 30 to 100 percent and are dominated by species such as beargrass (*Xerophyllum tenax*), several species of sedge (*Carex* spp.), pinegrass (*Calamagrostis rubescens*), arnica (*Arnica* spp.), and subalpine daisy (*Erigeron peregrinus*) (Fisher et al. 1998).

### Shrublands

Of the 5 million acres designated as shrubland in the planning area, approximately 1.8 million acres are underlain by bituminous coal deposits. Shrublands in Montana are divided into seven categories: Mixed Mesic Shrubs, Mixed Xeric Shrubs, Silver Sage, Salt-Desert Shrubs, Mesic-Grassland Shrubs, Xeric-Grassland Shrubs, and Sagebrush (see Table VEG-2).

**Mixed Mesic Shrub** sites are characterized by 20 to 100 percent shrub cover. Dominant shrubs on these sites are alder (*Alnus* spp.), ceanothus (*Ceanothus* spp), huckleberry (*Vaccinium* spp.), ninebark (*Physocarpus malvaceus*), snowberry (*Symphoricarpos* spp.), and western serviceberry (*Amelanchier alnifolia*).

**Mixed Xeric Shrub** sites are characterized by shrub cover ranging from 20 to 50 percent. Dominant shrubs for this type are bitterbrush (*Purshia tridentata*), creeping juniper (*Juniperus horizontalis*), greasewood (*Sarcobatus* spp.), mountain mahogany (*Cercocarpus* spp.), and rabbitbrush (*Chrysothamnus* spp.). Associated grass species cover from 5 to 40 percent of these sites and are predominantly bluebunch wheatgrass, blue grama, Idaho fescue, and western wheatgrass (*Agropyron smithii*).

**Silver Sage** sites are dominated by silver sage (*Artemisia cana*). This alkali-tolerant species is most abundant in the northeastern part of Montana on moist sites near riparian areas.

**Salt-Desert Shrub and Dry Salt Flat** sites are dominated by Saltsage (*Atriplex nuttallii*) at 10 to 40 percent cover. These sites are usually underlain by alkali-affected soils in dry, sandy, or saline-seep areas. Species associated with these sites are blue grama, Sandberg's bluegrass (*Poa secunda*), and threadleaf sedge (*Carex filifolia*). It occurs mainly in eastern and southeastern Montana.

**Mesic Shrub-Grassland Associations** are shrublands with co-dominance between shrubs and grasses that together cover 10 to 50 percent of the site. These are moist, ecotonal areas between shrub-dominated and grass-dominated sites. The grass and shrub species are those found in the respective classes that make up the association.

**Xeric Shrub-Grassland Associations** are shrublands with a co-dominance of xeric shrubs and grass species in the ecotone between grass- and xeric shrub-dominated sites with the same dominant species as those types. Cover of both shrubs and grasses on these sites range from 10 to 50 percent.

**Sagebrush** shrubland sites are dominated by big sagebrush (*Artemisia tridentata* spp. *tridentata*, *vaseyana*, and *wyomingensis*) and black sagebrush (*Artemisia nova*) at 20 to 80 percent cover. These are associated with the same grass species listed under the Mixed Xeric Shrub habitat type. Sagebrush shrublands are particularly characteristic of the counties that make up the Billings RMP area where more than 40 percent (910,000 acres) of shrublands fall within this category (Fisher et al. 1998).

## Forests

Of the 4.5 million acres classified as forest in the planning area, almost 1.4 million acres are underlain by bituminous coal deposits. The acreages underlain with subbituminous or bituminous coal within each forest type in the 16 counties affected by this project are given in Table VEG-3.

## Riparian Areas

Table VEG-4 gives the breakdown by type for riparian areas in the project area that are underlain by coal beds. The types with the most acreage are in the Graminoid and Forb and the Shrub categories.

**Graminoid and Forb Riparian** areas are characterized by herbaceous species at 30 to 100 percent cover and less than 15 percent cover of shrubs and trees. Standing water may be present in areas with cattail marshes. Plant species associated with this type are sedges (*Carex* spp.), cattails (*Typha* spp.), reedgrass (*Calamagrostis* spp.), rushes (*Juncus* spp.), saxifrage (*Saxifraga* spp.), and tufted hairgrass (*Deschampsia caespitosa*).

**Shrub Riparian** sites are dominated by shrub cover at 20 to 100 percent and tree cover at less than 15 percent. Standing water may be present in willow marshes in this category. Shrub species potentially present on shrub-dominated sites include alder (*Alnus* spp.), black hawthorn (*Crataegus douglasii*), birch (*Betula* spp.), currant (*Ribes* spp.), red-osier dogwood (*Cornus stolonifera*), rose (*Rosa* spp.), shrubby cinquefoil (*Potentilla fruticosa*), snowberry (*Symphoricarpos* spp.), thimbleberry (*Rubus parviflorum*), twinberry (*Lonicera involucrata*), Utah honeysuckle (*Lonicera utahensis*), and willows (*Salix* spp.) (Fisher et al. 1998).

## Barren Lands

Table VEG-5 shows that some of the classifications, such as Badlands and Missouri Breaks, have a significant number of species associated with them.

## Additional Tables

Additional Tables within this appendix include Tables VEG-6, VEG-7 and VEG-8; Table VEG-6 shows critically imperiled plant species in the state with potential habitat in the emphasis area, Table VEG-7 shows noxious weeds found in the state, and Table VEG-8 indicates critically imperiled plant species by project area.

## TABLE VEG-1
## GRASSLAND TYPES AND ASSOCIATED WILDLIFE DIVERSITY

| Grassland Types | Total Acres In Project Area With Underlying Bituminous Coal Beds | Distribution | Species Richness* |
|---|---|---|---|
| Altered Herbaceous Habitats | 87,365 | Found throughout Montana, but most concentrated in the northeastern part of the state. | 66 |
| Very Low Cover Grasslands | 35,4315 | Associated with alkaline soils or with disturbance. | 68 |
| Low to Moderate Cover Grasslands | 2,864,901 | Occurs across the state in valleys and foothills and on south aspects in the mountains. | 78 |
| Moderate to High Cover Grasslands | 228,341 | Associated with wet sites primarily in the valleys of central and eastern Montana. | 72 |
| Montane Parklands and Subalpine Meadows | 13,563 | Found at mid- to upper elevations either within forests or above timberline. | 62 |

*Mean number of native terrestrial vertebrates species predicted by habitat type (Fisher et al. 1998). Species richness estimates are simple species counts and not intended to imply that areas with fewer species are not as important as areas with larger numbers of species.

## TABLE VEG-2
## SHRUBLAND TYPES AND ASSOCIATED DISTRIBUTION AND SPECIES RICHNESS

| Shrubland Types | Total Acres in Project Area Underlain by Bituminous Coal Beds | Distribution | Species Richness* |
|---|---|---|---|
| Mixed Mesic Shrub | 186,229 | Found in western Montana and in draws or north slopes in eastern Montana | 63 |
| Mixed Xeric Shrub | 733,617 | Occur on dry rocky sites in valleys and low elevation mountain slopes. | 75 |
| Silver Sage | 7,900 | Primarily found in northeastern Montana on moist sites near riparian areas. | 61 |
| Salt-Desert Shrub and Dry Salt Flat | 22,226 | Usually associated with alkaline sites or blowouts in dry, sandy, or saline-seep areas in eastern Montana. | 29 |
| Sagebrush | 581,160 | Occur across the state in valleys and low- to mid-elevational mountain slopes. | 74 |
| Mesic Shrub-Grassland Associations | 120,950 | Found in central and eastern Montana valleys and some low mountain slope areas in moist ecotonal areas between shrub-dominated and grass-dominated sites. | 75 |
| Xeric Shrub-Grassland Associations | 155,091 | Occur primarily in eastern and central Montana valleys and some low mountain slopes on dry sites in valleys, in the ecotone between grass and xeric shrub dominated sites. | 85 |

*Mean number of native terrestrial vertebrates species predicted by habitat type for Montana (Fisher et al. 1998).

## TABLE VEG-3
## FOREST TYPES IN THE PROJECT AREA UNDERLAIN BY COAL BEDS

| Forest Type | Total Acres in Project Area Underlain by Bituminous Coal Deposits | Distribution | Species Richness* |
|---|---|---|---|
| Douglas-fir<br>(*Pseudotsuga menziesii*) | 23,985 | Occurs across the state, except for the northeastern corner, but primarily found in western and south-central Montana. | 77 |
| Douglas-fir with Lodgepole Pine | 2,446 | Occurs in western and south-central Montana on mid-upper elevational slopes. | 72 |
| Limber Pine<br>*(Pinus flexilis)* | 5,170 | Dry forest sites at lower elevations in central Montana and at higher elevations on limestone soils in central and eastern Montana. | 53 |
| Lodgepole Pine<br>*(Pinus contorta)* | 3,791 | Occurs primarily in western and south-central Montana in mountainous regions at cooler, mid-high elevations. | 65 |
| Low Density Xeric Forest | 304,760 | Occurs primarily in eastern Montana on low hills on the edge of grasslands. | 83 |
| Mixed Broadleaf & Conifer Forest | 28,179 | Occurs across the state, primarily in moist forest areas, near riparian areas or in woody draws. | 82 |
| Mixed Subalpine Forest | 71,368 | Occurs at mid-high elevations in western and south-central Montana, usually on north, east, and northwest aspects. | 67 |
| Mixed Whitebark Pine Forest | 218 | Occurs in high elevation forest stands at or near tree line in western and south-central Montana. | 39 |
| Mixed Xeric Forest | 34,382 | Occurs at low-mid elevations on dry forest sites in western Montana. | 76 |
| Ponderosa Pine | 857,864 | Occurs across the state, except in northeastern Montana at lower elevations on dry forest sites. | 79 |
| Rocky Mountain Juniper<br>*(Juniperus scopulorum)* | 18,547 | Occurs primarily in central and eastern Montana on dry forest sites. | 58 |
| Standing Burnt Forest | 2,008 | Occurs across the state in forested areas and includes only stands that have burned in the 5 years prior to 1998. | 63 |
| Utah Juniper<br>*(Juniperus osteosperma)* | 4,990 | Occurs primarily in central and eastern Montana on dry forest sites, particularly in Carbon County. | 70 |

*Mean number of native terrestrial vertebrate species predicted by habitat type (Fisher et al. 1998).

## TABLE VEG-4
## RIPARIAN AREAS IN THE PROJECT AREA UNDERLAIN BY COAL BEDS

| Riparian Types | Total Acres in Project Area Underlain by Bituminous Coal Deposits | Distribution | Species Richness* |
|---|---|---|---|
| Conifer | 1,205 | Occurs in riparian areas in western and south-central Montana. | 114 |
| Broadleaf | 44,324 | Occurs in riparian areas across Montana. | 123 |
| Mixed Broadleaf & Conifer | 6,789 | Occurs in riparian areas of western and south-central Montana. | 134 |
| Graminoid & Forb | 191,165 | Occurs across the state. | 72 |
| Mixed Riparian | 35,204 | Occurs across the state | 104 |
| Shrub | 99,671 | Occurs across the state. | 110 |

*Mean number of native terrestrial vertebrate species predicted by habitat type (Fisher et al. 1998).

## TABLE VEG-5
## BARREN LANDS

| Barren Lands | Total Acres in Project Area Underlain by Bituminous Coal Deposits | Distribution | Species Richness* |
|---|---|---|---|
| Badlands | 244,658 | Occurs primarily in central and eastern Montana on sites where bare soil or rock is the dominant cover. Patches of grass or shrubs total less than 10 percent cover. Tree canopy is less than 10 percent on treed sites. | 48 |
| Mines, Quarries, Gravel Pits | 15,248 | Occurs across Montana and are as named. | 13 |
| Missouri Breaks | 15,272 | Occurs between Fort Benton in the west and Fort Peck in the east and parallels the Missouri River. | 54 |
| Mixed Barren Sites | 50,489 | Occurs across the state where live vegetation provides less than 10 percent cover. | 17 |
| Rock | 26,982 | Exposed rock, cliffs, talus slopes, or scree fields across the state. | 14 |

*Mean number of native terrestrial vertebrate species predicted by habitat type (Fisher et al. 1998).

### TABLE VEG-6
### STATE OF MONTANA CRITICALLY IMPERILED PLANT SPECIES WITH POTENTIAL HABITAT IN THE 16-COUNTY AREA

| Common Name (Scientific Name) | Habitat |
|---|---|
| Dwarf onion (*Allium simillimum*) | Moist, often gravelly soil of meadows and grasslands in the montane or lower subalpine zone. |
| Daggett rock cress (*Arabis demissa var languida*) | Canyon bottoms and outwash plains with dry, stony soils derived from limestone in juniper woodland. |
| Swamp milkweed (*Asclepias incarnata*) | Wet meadows and thickets. |
| Ovalleaf milkweed (*Asclepias ovalifolia*) | Open pine woodland in seasonally moist meadow in southeastern Montana. |
| Narrowleaf milkweed (*Asclepias stenophylla*) | Sandy soils of prairies and open pine woodland in southeastern Montana. |
| Sweetwater milkvetch (*Astragalus aretioides*) | Thin soils of exposed ridges and slopes in the valleys and montane zone. |
| Barr's milkvetch *(Astragalus barrii)* | Gullied knolls, buttes, and barren hilltops, usually on calcareous soft shale or siltstone. |
| Wind River vetch (*Astragalus oreganus*) | Sandy or clayey soil in desert shrublands and sagebrush grassland in the valley zone in south-central Montana. |
| Wedge-leaved saltbush (*Atriplex truncata*) | Vernally moist, alkaline soil around ponds and along streams in the valleys. |
| Large-leafed balsamroot (*Balsamorhiza macrophylla*) | Sagebrush and grasslands in the montane zone. |
| Small camissonia (*Camissonia parvula*) | Sandy calcareous soils of sagebrush steppe and juniper woodlands in the valleys. |
| Pregnant sedge (*Carex gravida var. gravida*) | Open woods, often in ravines with deciduous trees, on the plains of southeastern Montana. |
| Many-ribbed sedge (*Carex multicostata*) | Grasslands and meadows in the montane and subalpine zones. |
| Toothed Scandinavian sedge (*Carex norvegica* ssp. *inserrulata*) | Moist alpine turf. |
| Tall centaury (Centaurium exaltatum) | Moist, alkaline soil around ponds and streams on the plains. |
| Birchleaf mountain-mahogany (*Cercocarpus montanus* var. *glaber*) | Open slopes and breaks on the plains of eastern Montana. |
| Smooth goosefoot (*Chenopodium subglabrum*) | Sparsely vegetated sand dunes and sandy terraces of major rivers on the plains of eastern Montana. |

## TABLE VEG-6
## STATE OF MONTANA CRITICALLY IMPERILED PLANT SPECIES WITH POTENTIAL HABITAT IN THE 16-COUNTY AREA

| Common Name (Scientific Name) | Habitat |
|---|---|
| Yellow bee plant (*Cleome lutea*) | Open, often-sandy soil of sagebrush steppe in the valleys. |
| Miner's Candle (*Cryptantha scoparia*) | Sandy soil of sagebrush steppe in the valleys. |
| Nine-anther dalea (*Dalea enneandra*) | Gravelly grasslands slopes on the plains of eastern Montana. |
| Silky prairie clover (*Dalea villosa* var. *villosa*) | Loose sand of sand dunes or eroded from sandstone outcrops in eastern Montana. |
| Scribner's panic grass (*Dichanthelium oligosanthes* var. *scribnerianum*) | Open ponderosa pine woodlands of valleys and plains. |
| White Arctic draba (*Draba fladnizensis*) | Rocky, open soil in the alpine zone. |
| Porsild's draba (*Draba porsildii*) | Moist, gravelly open soils in the alpine zone. |
| Entire-leaved avens (*Dryas integrifolia*) | Stony, limestone-derived soil of exposed ridges and plateaus in the alpine zone. |
| Eaton's daisy (*Erigeron eatonii* ssp. *eatonii*) | Open areas in mountains and foothills. |
| Beautiful fleabane (*Erigeron formosissimus* var. *viscidus*) | Meadows and forest openings in the montane and subalpine zones. |
| Smooth buckwheat (*Eriogonum salsuginosum*) | Barren, often bentonitic soil of badlands in the valleys. |
| Visher's buckwheat (*Eriogonum visheri*) | Barren, often bentonitic badlands slopes and outwashes in the plains. |
| Sheared cotton-grass (*Eriophorum calllitrix*) | Wet, organic soil of fens and seep areas in alpine tundra. |
| Joe Pye weed (*Eupatorium maculatum* var. *bruneri*) | Mesic meadows, springs, margins of streams, and swamp thickets in valleys and on the plains. |
| Hiker's gentian (*Gentianopsis simplex*) | Fens, meadows, and seeps, usually in areas of crystalline parent material, in the montane and subalpine zones. |
| Discoid goldenweed (*Haplopappus macronema* var. *macronema*) | Rocky, open or sparsely wooded slopes, often in coarse talus, in or near the alpine zone. |
| Hutchinsia (*Hutchinsia procumbens*) | Vernally moist, alkaline soil of sagebrush steppe in the valley to lower montane zones. |
| Large-fruited kobresia (*Kobresia macrocarpa*) | Moist tundra, solifluction* slopes, and gravelly lake shores in the alpine zone. |
| Island koenigia (*Koenigia islandica*) | Wet, open, gravelly soil in seepage areas in the alpine zone. |

## TABLE VEG-6
## STATE OF MONTANA CRITICALLY IMPERILED PLANT SPECIES WITH POTENTIAL HABITAT IN THE 16-COUNTY AREA

| Common Name (Scientific Name) | Habitat |
|---|---|
| Lesica's bladderpod (*Lesquerella lesicii*) | Gravelly, limestone-derived soil of open ridges and slopes among Douglas-fir and mountain mahogany woodlands in the montane zone. |
| Nuttall's desert parsley (*Lomatium nuttallii*) | Dry, rocky slopes of open pine woodland in the plains. |
| Desert dandelion (*Malacothrix torreyi*) | Dry, sandy sagebrush steppe in the valley and foothill zones. |
| Beardless mentzelia (*Mentzelia nuda*) | Sandy or gravelly soil of open hills and roadsides on the plains of eastern Montana |
| Dwarf purple monkeyflower (*Mimulus nanus*) | Dry, open, often gravelly or sandy slopes in the valleys and foothills. |
| Nama (*Nama densum*) | Sandy soil of sagebrush desert in the valleys. |
| Blue toadflax (*Nuttallanthus texanus*) | Open, sandy or acid shale soils of grasslands and woodlands on the plains of eastern Montana. |
| Alpine poppy (*Papaver kluanensis*) | Open, rocky slopes with delayed snowmelt in the alpine zone. |
| Large flowered beardtongue (*Penstemon grandiflorus*) | Sandy soils of valley plains. |
| Double bladderpod (*Physaria brassicoides*) | Stony or sandy soil of open grassland slopes on the plains in southeastern Montana. |
| Woolly twinpod (*Physaria didymocarpa* var. *lanata*) | Sandy, often calcareous soil of open grassland or shrubland slopes in the plains. |
| Slender-branched popcorn-flower (*Plagiobothrys leptocladus*) | Dry mud on the shores of ponds in plains and foothills. |
| Short-leaved bluegrass (*Poa curta*) | Sparsely vegetated soil of Douglas-fir forest floor in the montane zone. |
| Low arctic cinquefoil (*Potentilla hyparctica*) | Moist turf in the alpine zone. |
| Platte cinquefoil (*Potentilla plattensis*) | Grasslands and sagebrush steppe in the valley and montane zones in south-central Montana. |
| One-flowered cinquefoil (*Potentilla uniflora*) | Open, gravelly slopes and ridgetops in the alpine zone. |
| Bur oak (*Quercus macrocarpa*) | Low, shale-derived hills on the plains. |
| Arctic buttercup (*Ranunculus gelidus*) | Moist, open soil on tundra and talus slopes in the alpine zone. |
| High-artic buttercup (*Ranunculus hyperboreus*) | Wet soil around ponds and along streams in the montane zone. |
| Persistent-sepal yellow-cress (*Rorippa calycina*) | Riverbanks and shorelines in the valleys on the plains on the Missouri and Yellowstone Rivers. |

## TABLE VEG-6
## STATE OF MONTANA CRITICALLY IMPERILED PLANT SPECIES WITH POTENTIAL HABITAT IN THE 16-COUNTY AREA

| **Common Name (Scientific Name)** | **Habitat** |
|---|---|
| Barratt's willow (*Salix barrattiana*) | Cold, moist soil in the alpine zone. |
| Yellow marsh saxifrage (*Saxifraga hirculus*) | Wet, organic soil of fen in the alpine zone. |
| Clasping groundsel (*Senecio amplectens* var. *holmii*) | Stony, open soil and talus of slopes in or near the alpine zone. |
| Cut-leaf groundsel (*Senecio eremophilus* var. *eremophilus*) | Moist streambanks and riparian forests in the valley and montane zones in south-central Montana. |
| Few-flowered butterweed (*Senecio pauciflorus*) | Moist meadows and cliffs in the montane zone. |
| Shoshonea (*Shoshonea pulvinata*) | Open, exposed limestone outcrops, ridgetops, and canyon rims, in thin rocky soils. |
| Oregon checker-mallow (*Sidalcea oregana*) | Grasslands in the valley and montane zones. |
| Prairie aster (*Solidago ptarmicoides*) | Open, dry grasslands, often on sandy soil or limestone on the plains of eastern Montana. |
| Few-flowered goldenrod (*Solidago sparsiflora*) | Sandy soil of grasslands or open woodlands on the plains. |
| Slender wedgegrass (*Sphenopholis intermedia*) | Wet areas in the valleys or foothills. |
| Fleshy stitchwort (*Stellaria crassifolia*) | Moist or wet meadows, often along streams, in the foothills to alpine zones. |
| Letterman's needlegrass (*Stipa lettermanii*) | Limestone talus and dry fescue grassland in the valley and foothill zones in southern Montana. |
| Purpus' sullivantia (Sullivantia hapemanii var. hapemanii) | Calcium-rich springs and seeps on moist canyon walls, streambank rocky zones, and near the spray zone of waterfalls. |
| California false-hellebore (*Veratrum californicum*) | Wet meadows and streambanks in montane and subalpine zones. |
| Nannyberry (*Viburnum lentago*) | Openings in riparian forests on the plains. |
| Many-flowered viguiera (*Viguiera multiflora*) | Aspen woodlands and open slopes. |

*A type of creep that takes place in regions where the ground freezes to a considerable depth and as it thaws during the warm seasons the upper thawed position creeps downhill over the frozen material. The soil moves as a viscous liquid down slopes of as little as 2 or 3 degrees and may carry rocks of considerable size in suspension.

## TABLE VEG-7
## STATE OF MONTANA NOXIOUS WEEDS

| Common Name | Scientific Name | Category |
|---|---|---|
| hoary cress | *Cardaria draba* | 1 |
| Cardaria complex (combined) | *Cardaria* spp. | 1 |
| diffuse knapweed | *Centaurea diffusa* | 1 |
| spotted knapweed | *Centaurea maculosa* | 1 |
| Russian knapweed | *Centaurea repens* | 1 |
| yellow starthistle | *Centaurea solstitialis* | 3 |
| rush skeletonweed | *Chondrilla juncea* | 3 |
| oxeye daisy | *Chrysanthemum leucanthemum* | 1 |
| Canada thistle | *Cirsium arvense* | 1 |
| field bindweed | *Convolvulus arvensis* | 1 |
| common crupina | *Crupina vulgaris* | 3 |
| houndstongue | *Cynoglossum officinale* | 1 |
| leafy spurge | *Euphorbia esula* | 1 |
| orange hawkweed | *Hieracium aurantiacum* | 2 |
| meadow hawkweed | *Hieracium caespitosum* | 2 |
| yellow-devil hawkweed | *Hieracium floribundum* | 2 |
| kingdevil hawkweed | *Hieracium piloselloides* | 2 |
| common St. Johnswort | *Hypericum perforatum* | 1 |
| dyer's woad | *Isatis tinctoria* | 2 |
| dalmatian toadflax | *Linaria dalmatica* | 1 |
| purple loosestrife | *Lythrum salicaria* | 2 |
| sulfur cinquefoil | *Potentilla recta* | 1 |
| tall buttercup | *Ranunculus acris* | 2 |
| tansy ragwort | *Senecio jacobaea* | 2 |
| saltcedar | *Tamarix ramosissima* | 2 |
| common tansy | *Tanacetum vulgare* | 1 |

1 = Noxious weed: currently established and generally widespread in many counties.
2 = Noxious weed: recently introduced and rapidly spreading.
3 = Noxious weeds: not detected in the state or found only in small, scattered, localized infestations.

## TABLE VEG-8
## STATE OF MONTANA CRITICALLY IMPERILED PLANT SPECIES BY PROJECT AREA

| | | | Additional Information | | | |
|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Known to Occur in the 16 Counties** | **Life Form** | **BLM** | **USFS** | **Wetland Indicator** |
| Dwarf onion | *Allium simillimum* | Gallatin | HP | | | |
| Daggett rock cress | *Arabis demissa var languida* | Carbon | HP | W | | |
| Swamp milkweed | *Asclepias incarnata* | Carbon | HP | | | OBL |
| Ovalleaf milkweed | *Asclepias ovalifolia* | Carter | HP | W | S | |
| Narrowleaf milkweed | *Asclepias stenophylla* | Carter and Rosebud | HP | W | | |
| Barr's Milkvetch | *Astragalus barrii* | Big Horn, Carter, Powder River, and Rosebud | HP | W | S | |
| Wind River vetch | *Astragalus oreganus* | Carbon | HP | W | | |
| Wedge-leaved saltbush | *Atriplex truncata* | Park | HA | W | | |
| Large-leafed balsamroot | *Balsamorhiza macrophylla* | Gallatin | HP | W | S | |
| Small camissonia | *Camissonia parvula* | Carbon | HA | S | | |
| Pregnant sedge | *Carex gravida* var. *gravida* | Big Horn, Powder River, and Rosebud | Se | | | |
| Many-ribbed sedge | *Carex multicostata* | Gallatin and Park | Se | W | | |
| Toothed Scandinavian sedge | *Carex norvegica* ssp. *inserrulata* | Carbon, Park, and Stillwater | Se | | | |
| Birchleaf mountain-mahogany | *Cercocarpus montanus* var. *glaber* | Treasure | SH | W | | |
| Smooth goosefoot | *Chenopodium subglabrum* | Carter, Custer, Powder River, | HA | W | | |
| Yellow bee plant | *Cleome lutea* | Big Horn and Carbon | HA | W | | |
| Miner's Candle | *Cryptantha scoparia* | Carbon | HA | S | | |
| Nine-anther dalea | *Dalea enneandra* | Custer | HP | W | | |

## TABLE VEG-8
## STATE OF MONTANA CRITICALLY IMPERILED PLANT SPECIES BY PROJECT AREA

| | | | Additional Information | | | |
|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Known to Occur in the 16 Counties** | **Life Form** | **BLM** | **USFS** | **Wetland Indicator** |
| Silky prairie clover | *Dalea villosa* var. *villosa* | Carter | HP | W | | |
| Scribner's panic grass | *Dichanthelium oligosanthes* var. *scribnerianum* | Powder River | PGr | W | | |
| White Arctic draba | *Draba fladnizensis* | Carbon and Stillwater | HP | | | |
| Porsild's draba | *Draba porsildii* | Carbon | HP | | | |
| Entire-leaved avens | *Dryas integifolia* | Golden Valley | SH | | | |
| Eaton's daisy | *Erigeron eatonii* ssp. *eatonii* | Sweet Grass | HP | | | |
| Beautiful fleabane | *Erigeron formosissimus* var. *viscidus* | Carbon and Park | HP | W | | |
| Smooth buckwheat | *Eriogonum salsuginosum* | Carbon | HA | S | | |
| Visher's buckwheat | *Eriogonum visheri* | Carter | HA | | | |
| Sheathed cotton-grass | *Eriophorum calllitrix* | Carbon | G-L | | | |
| Hiker's gentian | *Gentianopsis simplex* | Carbon | HA | W | S | |
| Bractless hedge-hyssop | *Gratiola ebracteata* | Yellowstone | HA | | | |
| Discoid goldenweed | *Haplopappus macronema* var. *macronema* | Gallatin | SH | | S | |
| Hutchinsia | *Hutchinsia procumbens* | Carbon | HA | W | | |
| Large-fruited kobresia | *Kobresia macrocarpa* | Carbon | G-L | | | |
| Island koenigia | *Koenigia islandica* | Carbon | HA | | | |
| Lesica's bladderpod | *Lesquerella lesicii* | Carbon | HPsl | S | | |
| Nuttall's desert parsley | *Lomatium nuttallii* | Big Horn | HP | W | | |

## TABLE VEG-8
## STATE OF MONTANA CRITICALLY IMPERILED PLANT SPECIES BY PROJECT AREA

| | | | Additional Information | | | |
|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Known to Occur in the 16 Counties** | **Life Form** | **BLM** | **USFS** | **Wetland Indicator** |
| Desert dandelion | *Malacothrix torreyi* | Carbon | HA | S | | |
| Beardless mentzelia | *Mentzelia nuda* | Custer, Powder River | HB | W | | |
| Dwarf purple monkeyflower | *Mimulus nanus* | Gallatin | HA | | | |
| Nama | *Nama densum* | Carbon | HA | S | | |
| Blue toadflax | *Nuttallanthus texanus* | Carter | HA | W | | |
| Alpine poppy | *Papaver kluanensis* | Carbon, Park, and Sweet Grass | HPsl | | | |
| Large flowered beardtongue | *Penstemon grandiflorus* | Custer | HP | | | |
| Double bladderpod | *Physaria brassicoides* | Carter and Powder River | HP | | | |
| Woolly twinpod | *Physaria didymocarpa* var. *lanata* | Big Horn | HP | | | |
| Slender-branched popcorn-flower | *Plagiobothrys leptocladus* | Custer | HA | W | | |
| Short-leaved bluegrass | *Poa curta* | Carbon | PGr | W | | |
| Low arctic cinquefoil | *Potentilla hyparctica* | Carbon | HP | | | |
| Platte cinquefoil | *Potentilla plattensis* | Big Horn and Carbon | HP | W | | W/FACW+ |
| One-flowered cinquefoil | *Potentilla uniflora* | Potential, None Known | HP | | | |
| Bur oak | *Quercus macrocarpa* | Carter | TR | S | | FAC-U |
| Arctic buttercup | *Ranunculus gelidus* | Stillwater | HPsl | | | |
| High-artic buttercup | *Ranunculus hyperboreus* | Gallatin | HP | | | |
| Persistent-sepal yellow-cress | *Rorippa calycina* | Custer and Yellowstone | HP | | | OBL |
| Barratt's willow | *Salix barrattiana* | Carbon | SH | | S | |
| Yellow marsh saxifrage | *Saxifraga hirculus* | Carbon | HP | | | |

## TABLE VEG-8
## STATE OF MONTANA CRITICALLY IMPERILED PLANT SPECIES BY PROJECT AREA

| | | | Additional Information | | | |
|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Known to Occur in the 16 Counties** | **Life Form** | **BLM** | **USFS** | **Wetland Indicator** |
| Clasping groundsel | *Senecio amplectens* var. *holmii* | Carbon | HP | | | |
| Cut-leaf groundsel | *Senecio eremophilus* var. *eremophilus* | Big Horn and Park | HP | | | FAC |
| Few-flowered butterweed | *Senecio pauciflorus* | Gallatin | HP | | | |
| Shoshonea | *Shoshonea pulvinata* | Carbon | HP | S | S | |
| Oregon checker-mallow | *Sidalcea oregana* | Gallatin | HP | | | |
| Prairie aster | *Solidago ptarmicoides* | Carter | HP | | | |
| Few-flowered goldenrod | *Solidago sparsiflora* | Stillwater | HP | W | | |
| Slender wedgegrass | *Sphenopholis intermedia* | Big Horn and Gallatin | AGr/PGr sl | W | | |
| Fleshy stitchwort | *Stellaria crassifolia* | Carbon | HP | W | | OBL |
| Letterman's needlegrass | *Stipa lettermanii* | Big Horn, Carbon, Park | PGr | | | |
| California false-hellebore | *Veratrum californicum* | Gallatin, | HP | W | S | |
| Nannyberry | *Viburnum lentago* | Big Horn | SH | | | |
| Many-flowered viguiera | *Viguiera multiflora* | Gallatin | HP | | | |

Agr=annual grass
FAC=facultative plant
FACN+=facultative wetland plus plant
GL=grass-like
HA=herbaceous annual
HP=herbaceous perennial
OBL=obligate wetland plant
PGr=perennial grass
S=sensitive
Se=sedge
SH=shrub
W=watch

# WILDLIFE APPENDIX

# WILDLIFE APPENDIX

This appendix contains the letter from the BLM that formally submitted the Biological Assessment to the U.S. Fish and Wildlife Service (FWS) for review under Section 7 of the Endangered Species Act of 1973. Additional consultation with the FWS is described in Chapter 5. This appendix also contains a series of tables that are cited in Chapter 4 of the EIS Wildlife section. Following the tables is a copy of the CBM Programmatic Wildlife Monitoring and Protection Plan developed by the BLM for the EIS. A copy of the Biological Assessment and Biological Opinion are also attached.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Miles City Field Office
111 Garryowen Road
Miles City, Montana 59301-0940
http://www.mt.blm.gov/mcfo/

IN REPLY TO:
1310 CBMP

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

FEB 8 2002

R. Mark Wilson
Field Supervisor
USFWS - Ecological Services
100 North Park, Suite 320
Helena, Montana 59601

Dear Mr. Wilson:

The Bureau of Land Management (BLM), Miles City and Billings Field Offices, the Montana Board of Oil and Gas Conservation and the Montana Department of Environmental Quality have jointly prepared the "*Montana Statewide Draft Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans*" (EIS). The document primarily addresses coal bed methane development within southeastern and south-central Montana. A copy has been enclosed for your review.

Pursuant to BLM's responsibility under Section 7 of the Endangered Species Act of 1973, in accordance with Code of Federal Regulations 50 Part 407.12, and to also address your concerns from correspondence dated April 7, 2001, we are forwarding a copy of the "Biological Assessment for Coal Bed Methane Production in Montana" for your 30-day review.

We have found that there would be "no effect" to Canada lynx, gray wolf, grizzly bear, interior least tern and the warm spring zaitzevian riffle beetle. We have also determined a "may effect, but not likely to adversely impact" finding for Ute ladies-tresses orchid, black-footed ferret, mountain plover, bald eagle, pallid sturgeon and Montana arctic grayling. The black-tailed prairie dog is discussed but no finding is made as it is not a threatened, endangered or candidate species.

Please respond whether or not you concur with the findings of the Biological Assessment. Your review of this document and follow-up comments will be greatly appreciated. Your evaluation will also help guide BLM to other levels of Section 7 consultation should they be required.

If changes are made between the Draft and Final EISs that would have an effect on threatened or endangered species other than those described in the draft, the BLM will reinitiate consultation with you.

Please contact Larry Rau, Wildlife Biologist in the Miles City Field Office, at 233-2843 if you have any questions. Thank you for your continued assistance on this project.

Sincerely,

/s/ Aden L. Seidlitz

Aden L. Seidlitz
Associate Field Manager

2 Enclosures
1-Draft EIS (276pp)
2-Biological Assessment (21pp)

cc: Jay Parks, MT010

## TABLE WIL-1
## WILDLIFE SPECIES OF CONCERN

| Common Name | Scientific Name | Counties | Additional Information | | | |
|---|---|---|---|---|---|---|
| | | | MT | BLM | USFS | Suitable Habitat |
| **Mammals** | | | | | | |
| Pallid bat | *Antrozous pallidus* | Carbon | S1 | | S | Arid areas with rocky outcrops, dry forests, riparian forests, and ponderosa pine low slope forests in south-central Montana (UM). |
| Townsend's big-eared bat | *Corynorhinus (Plecotus ) townsendii* | All | S2S3 | SS | S | Arid scrub and pine forest, uses caves, snags, old mines and buildings the Custer and Gallatin National Forests (NM). |
| Spotted bat | *Euderma maculatum* | Big Horn, Carbon, Powder River | S1 | SS | S | Various habitats in south-central Montana from open coniferous to pastureland. |
| Eastern red bat | *Lasiurus borealis* | | S1 | | | Open forest, woody draws, and farm shelter-belts (M). |
| Northern myotis | *Myotis septentrionalis* | None known in emphasis area. | S1 | | | Mixed and coniferous forests with small woodland pools and streams, in clearings (NM). Lower Missouri River. |
| Pygmy rabbit | *Brachylagus idahoensis* | None known in emphasis area. | S2S3 | SS | S | Areas with tall, dense sagebrush cover. |
| Hispid pocket mouse | *Chaetodipus hispidus* | Carter and Powder River | S1 | | | Arid, open prairie land. |
| White-tailed prairie dog | *Cynomys leucurus* | Carbon | S1 | SS | S | Grasslands and plains. |
| Black-tailed prairie dog | *Cynomys ludovicianus* | All | S3S4 | SS | S | Short-grass and mixed-grass prairie in the east of the 110th meridian Fort Belknap Reservation, and Crow Reservation. |
| North American wolverine | *Gulo gulo luscus* | Park and Gallatin | S2 | SS | S | Mature and old-growth fir, pine and larch forests, alpine shrub, talus, and riparian cottonwoods. |
| Spotted skunk | *Spilogale gracilis* | Carbon | | SS | | Rocky, brushy grasslands, riparian areas and forest/shrub ecotones. |

## TABLE WIL-1
## WILDLIFE SPECIES OF CONCERN

| Common Name | Scientific Name | Counties | Additional Information | | | |
|---|---|---|---|---|---|---|
| | | | MT | BLM | USFS | Suitable Habitat |
| Fisher | *Martes pennanti* | Park and Gallatin | S1S2 | SS | S | Forests with mixed habitat, several structural classes, edges and riparian areas. |
| Merriam's shrew | *Sorex merriami* | All SE MT counties and Blaine | S3 | SS | | Sagebrush and mountain brush areas and arid forests with sagebrush or bunchgrass. |
| Northern bog lemming | *Synaptomys borealis* | None known in project area. | S2 | SS | S | Damp pastures, tundra, cool bogs, peatlands, marshes, or moist meadows. |
| Preble's shrew | *Sorex preblei* | Carbon, Musselshell, Treasure, Rosebud, Big Horn | S3 | SS | | Dry sagebrush and sagebrush-grasslands. |
| Swift fox | *Vulpes velox* | All counties east of Continental Divide | S1 | SS | S | Short to midgrass prairie habitat. |
| **Herptiles** | | | | | | |
| Boreal/Western toad | *Bufo boreas* | Park, Carbon, Sweetgrass, Gallatin | S3S4 | | S | Breeding ponds, summer range, and overwinter refugia within lodgepole pine or spruce-fir forests. |
| Canadian toad | *Bufo hemiophyrs* | None known in project area. | S1 | SS | S | Shallow wetlands, streams, ditches, margins of prairie wetlands. |
| Wood frog | *Rana sylvatica* | Big Horn** | | SS | | Temporary ponds, lakes, and streams with adjacent forests or brush with damp litter. |
| Northern leopard frog | *Rana pipiens* | All | S3S4 | | S | Streams, ponds, lakes, wet prairies, and other bodies of water, frequently moving into grassy, herbaceous fields or forest borders some distance from permanent water. |
| Snapping turtle | *Chelydra serpentiana* | Eastern Counties | S3 | SS | | Shallow, mud-bottomed backwaters and ponds with lush aquatic vegetation. |
| Spiny softshell | *Trionyx spiniferus* | Eastern Counties | S3 | SS | | Rivers, backwaters, lakes, and ponds with sand or mud areas for digging nests. Missouri and Yellowstone Rivers |

### TABLE WIL-1
### WILDLIFE SPECIES OF CONCERN

| Common Name | Scientific Name | Counties | Additional Information MT | BLM | USFS | Suitable Habitat |
|---|---|---|---|---|---|---|
| **Birds** | | | | | | |
| Swainson's hawk | *Buteo swainsoni* | All | S4B, SZN | SS | | Shrub-steppe, prairie with scattered trees, or open woodlands. |
| Ferruginous hawk | *Buteo regalis* | All | S3B, SZN | | S | Undisturbed plains or shrub-steppe with relatively unbroken terrain and scattered trees, rocks, or treed creek bottoms. |
| Northern goshawk | *Accipiter gentilis* | Carbon, Park, Gallatin, Powder River, Rosebud | S3S4 | SS | S | Coniferous, deciduous, and mixed forests with a high density of large, old trees and high overstory canopy. |
| Burrowing owl | *Athene cunicularia* | All | S3S4 | SS | S | Burrows made by prairie dogs or badgers in rangeland and prairie areas. |
| Great gray owl | *Strix nebulosa* | Carbon, Park, Gallatin, Sweetgrass | S3 | SS | | Dense, often moist, forests, with openings for hunting. |
| Flammulated owl | *Otus flammeolus* | Gallatin, Park | S3B,SZN | SS | S | Stands of mature ponderosa pine and Douglas fir with tree cavities. |
| Canvasback duck | *Aythya valisineria* | All | | SS | | Large, shallow prairie marshes bordered by dense emergent vegetation with areas of open water. |
| Harlequin duck | *Histrionicus histrionicus* | Carbon, Park, Gallatin | S2B,SZN | SS | S | Summer on mountain streams and rivers, nest on the ground near water's edge or in the hollows of dead trees. |
| Trumpeter swan | *Cygnus buccinator* | Carbon, Park, Gallatin | S2B, S2N | SS | | Shallow freshwater marshes, ponds, lakes, and slow-moving rivers with both submerged and emergent vegetation. |
| White-faced ibis | *Plegadis chihi* | Carbon, Park | S1B, SZN | SS | | Freshwater wetlands (marshes, ponds, swamps) with islands of emergent vegetation. |
| Long-billed curlew | *Numenius americanus* | All | | SS | | Open grasslands and prairies, often near water. |

## TABLE WIL-1
## WILDLIFE SPECIES OF CONCERN

| Common Name | Scientific Name | Counties | Additional Information | | | |
|---|---|---|---|---|---|---|
| | | | MT | BLM | USFS | Suitable Habitat |
| Columbian sharp-tailed grouse | *Tympanuchus phasianellus columbianus* | None known in project area | S1 | | S | Native bunchgrass and sagebrush-steppe with plant species diversity and structural diversity |
| Cassin's kingbird | *Tyrannus vociferans* | Southeastern counties | S1 | | | Open country with pinyon-juniper or Ponderosa pine, open scrub, and shrub-steppe. |
| Loggerhead shrike | *Lanius ludovicianus* | All | | SS | | Edge habitat with open country, thinly wooded or scrubby land with clearings, meadows, and aspen stands bordering dense, ungrazed or lightly grazed grassland. |
| Blue-gray gnatcatcher | *Polioptila caerulea* | Carbon | S1 | | | Juniper and limber pine in the Pryor Mountains of south-central Montana. |
| Sage sparrow | *Amphispiza belli* | NI | | SS | | Sagebrush steppe species, not confirmed in Montana. |
| Baird's sparrow | *Ammodramus bairdii* | Eastern Counties | S3S4B<br>SZN | | S | Open tall to mixed grass areas with mixture of mostly native prairie grasses and forbs. |
| Hairy woodpecker | *Picoides villosus* | All | | SS | | Various types of forest stands throughout Montana. |
| Pileated woodpecker | *Dryocopus pileatus* | Park, Gallatin | | SS | | Mature forests with large snags. |
| Three-toed woodpecker | *Picoides tridactylus* | Carbon, Park, Gallatin, Big Horn, Sweetgrass | | SS | | Pine-dominated mature forests and burned areas in early successional stages. |
| Black-backed woodpecker | *Picoides articusi* | Park, Gallatin | S3 | SS | S | Coniferous forests, especially early post-fire habitat |
| Dickcissel | *Spiza americana* | Eastern Counties | S1 | SS | | Hayfields, pastures, weedy fallow fields, and the weedy margins of ditches and roadsides |

## TABLE WIL-1
## WILDLIFE SPECIES OF CONCERN

| Common Name | Scientific Name | Counties | Additional Information | | | |
|---|---|---|---|---|---|---|
| | | | MT | BLM | USFS | Suitable Habitat |
| **Fish** | | | | | | |
| Yellowstone Cutthroat Trout | *Oncorhynchus clarki bouvieri* | Western Counties | S2 | SS | S | Mountain lakes and streams with varying habitat structures and water velocities. |
| Westslope Cutthroat Trout | *Oncorhynchus clarki lewisi* | Gallatin | S3 | SS | S | Small, isolated streams in mountainous areas. |
| Blue sucker | *Cycleptus elongatus* | Eastern Counties | S3? | SS | | Deep water of large rivers and reservoirs with low turbidity and swift current. |
| Paddlefish | *Polyodon spathula* | Eastern Counties | S1S2 | | | Historically found in calm, open waters of large rivers in the Mississippi River drainage as far north as the Missouri River in Montana. |
| Shorthead sculpin | *Cottus confusus* | NI | S3 | | S | Cold, fast riffles in streams with gravel. |
| Northern redbelly dace X Finescale dace* | *Phoxinus eos X Phoxinus neogaeus* | Western Counties | S3 | SS | | Boggy lakes, creeks, and ponds, often with cool, dark, tea-colored water. |

*Hybrid, always female.
**Possible/not confirmed.
M=migratory.
UM=unknown migration.
NM=nonmigratory, year-round resident.
NI=no information.
S and SS=species of concern.
S1=critically imperiled in the state.
S2=vulnerable to extinction.
S3=rare or restricted in range.
B= Breeding status of a migratory species.
Z= Ranking not applicable.
N= Non-breeding status of a migratory species.

## TABLE WIL-2
## AQUATIC RESOURCES CHARACTERISTICS OF MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS AND POWDER RIVER RESOURCE MANAGEMENT PLAN AREAS AND IN PARK, GALLATIN, AND BLAINE COUNTIES[1]

| Location and Drainage | Length (miles)[2] | Aesthetics[3] | Fisheries Management[4] | Fisheries Resource Value[5] | Number of Fish Species Present | Dewatering Problem Identified?[6] |
|---|---|---|---|---|---|---|
| **Billings Resource Management Area** | | | | | | |
| Yellowstone River West of Billings | 134 | National renown, clean stream and natural setting, stream and area fair | Trout | Outstanding, high, substantial | 20 | Periodic |
| Boulder River | 66 | Natural beauty, pristine | Trout | Outstanding, high, substantial | 9 | Chronic |
| Stillwater River | 73 | Natural beauty, clean stream and natural setting | Trout | Outstanding, high, substantial | 9 | No |
| Clarks Fork of the Yellowstone | | | | | | |
| Downstream Section | 43 | Stream and area fair | Non-trout | Substantial | 19 | Periodic |
| Upstream Section | 30 | Clean stream and natural setting | Trout | Substantial | 12 | Chronic |
| Yellowstone River East of Billings | 26 | Clean stream and natural setting, stream and area fair | Warm/cool water and non-trout | High | 28 | Periodic |
| Bighorn River | | | | | | |
| Downstream Section | 59 | Stream and area fair | Trout | High | 30 | Periodic |
| Little Bighorn River | 116 | Natural beauty, clean stream and natural setting | Warm/cool water and trout | Moderate | 8 | No |
| Upstream Section | 38 | National renown | Trout | Outstanding | 17 | No |
| Musselshell River | 246 | Clean stream and natural setting, stream and area fair | Trout | High, substantial | 32 | Chronic |
| Careless Creek | 56 | Clean stream and natural setting, stream and area fair | Warm/cool water and trout | Substantial, moderate, limited | 10 | Chronic |
| **Powder River Resource Management Area** | | | | | | |
| Yellowstone River | 64 | Clean stream and natural setting | Non-trout | High | 40 | No |
| Rosebud Creek | 208 | Stream and area fair | Undesignated | High, substantial | 21 | No |

## TABLE WIL-2

## AQUATIC RESOURCES CHARACTERISTICS OF MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS AND POWDER RIVER RESOURCE MANAGEMENT PLAN AREAS AND IN PARK, GALLATIN, AND BLAINE COUNTIES[1]

| Location and Drainage | Length (miles)[2] | Aesthetics[3] | Fisheries Management[4] | Fisheries Resource Value[5] | Number of Fish Species Present | Dewatering Problem Identified?[6] |
|---|---|---|---|---|---|---|
| Tongue River | | | | | | |
| Downstream Section | 93 | Clean stream and natural setting, stream and area fair | Non-trout | High, substantial | 33 | Periodic |
| Pumpkin Creek | 172 | Clean stream and natural setting, stream and area fair | Non-trout and undesignated | Substantial, moderate, limited | 20 | No |
| Upstream Section | 114 | Clean stream and natural setting | Trout | High | 26 | No |
| Otter Creek | 103 | Stream and area fair | Undesignated | Substantial, moderate | 20 | No |
| Hanging Woman Creek | 47 | Clean stream and natural setting | Undesignated | Substantial, moderate | 23 | No |
| Powder River | | | | | | |
| Downstream Section | 156 | Low | Non-trout | High | 21 | Chronic |
| Mizpah Creek | 150 | Low, clean stream and natural setting | Non-trout and undesignated | Moderate, limited | 18 | No |
| Little Powder River | 72 | Stream and area fair | Non-trout | Substantial | 13 | No |
| Upstream Section | 77 | Low, natural and pristine beauty | Warm/cool water | High | 21 | Chronic |
| Little Missouri River | 103 | Clean stream and natural setting | Non-trout | High | 18 | No |
| **Park County** | | | | | | |
| Yellowstone River | 104 | National renown | Trout | Outstanding | 12 | No |
| Shields Creek | 65 | Clean stream and natural setting | Trout | High, substantial | 10 | Periodic |
| **Gallatin County** | | | | | | |
| Missouri River | 27 | National renown | Trout | High | 13 | Periodic |
| Gallatin River | 102 | National renown, clean stream and natural setting | Trout | Outstanding, high | 12 | Chronic/Periodic |

## TABLE WIL-2
## AQUATIC RESOURCES CHARACTERISTICS OF MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS AND POWDER RIVER RESOURCE MANAGEMENT PLAN AREAS AND IN PARK, GALLATIN, AND BLAINE COUNTIES[1]

| Location and Drainage | Length (miles)[2] | Aesthetics[3] | Fisheries Management[4] | Fisheries Resource Value[5] | Number of Fish Species Present | Dewatering Problem Identified?[6] |
|---|---|---|---|---|---|---|
| Madison River | 20 | National renown | Trout | Outstanding | 13 | No |
| Jefferson River | 19 | Clean stream and natural setting | Trout | Substantial | 12 | Chronic |
| **Blaine County** | | | | | | |
| Missouri River | 38 | National renown | Non-trout | Outstanding | 26 | No |
| Cow Creek | 54 | Clean stream and natural setting | Trout | Moderate | 8 | No |
| Milk River | 110 | Stream and area fair | Non-trout | High | 31 | No |
| Lodge Creek | 73 | Stream and area fair | Non-trout | High | 18 | No |
| Peoples Creek | 113 | Clean stream and natural setting | Trout and non-trout | Substantial, moderate | 14 | No |

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[1] Information derived from the Montana Natural Resource Information System on the Internet at http://nris.state.mt.us/wis/mris1.html. Multiple values for a resource characteristic indicate river reach differences within a given drainage.

[2] Estimated length of drainage within the Resource Management Area or county.

[3] Aesthetics ratings in descending order are: national renown; natural and pristine beauty with some development; clean stream and natural setting; stream and area fair; and low.

[4] Categories of fisheries management are: trout; non-trout; warm/cool water; and undesignated.

[5] Fisheries resource values ratings in descending order are: outstanding; high; substantial; moderate; and limited.

[6] Dewatering indicates a reduction in streamflow beyond the point where stream habitat is adequate for fish and usually occurs during the irrigation season (July through September). Periodic dewatering indicates a significant problem in drought or water-short years, and chronic dewatering indicates a significant problem in virtually all years.

## TABLE WIL-3
## COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES ND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS RESOURCE MANAGEMENT PLAN AREA[1]

| Common Name | Scientific Name | Yellowstone River West of Billings | Boulder River | Stillwater River | Clarks Fork of the Yellowstone | | Yellowstone River East of Billings | Bighorn River | | Little Bighorn River | Musselshell River | Careless Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Downstream Section | Upstream Section | | Downstream Section | Upstream Section | | | |
| Goldeye | *Hiodon alasoides* | A, C, U, R | | | A | | A | A | C, R | | A, C, R | |
| Lake chub | *Couesius plumbeus* | | | | U | C | R | R | | | R | A |
| Common carp[2] | *Cyprinus carpio* | C, U, R | | | R | | C | A, C | A, C | | A, C, U | |
| Western silvery/plains minnow | *Hybognathus argyritis/placitus* | | | | U | R | | C, U | R | | A, C, U | |
| Brassy minnow | *Hybognathus hankinsoni* | | | | | | | | | | U, R | |
| Emerald shiner | *Notropis atherinoides* | C, U, R | | | | R | C | U | | | C, R | |
| Sand shiner | *Notropis stramineus* | | | | | | | | | | A, U, R | |
| Northern redbelley/finescale dace | *Phoxinus eos/neogaeus* | | | | | | | | | | U | U |
| Fathead minnow | *Pimephales promelas* | | | | | | | U | | | U | U |
| Flathead chub | *Platygobio gracilis* | | | | | | A, C | C | | | A, C, U, R | A |
| Longnose dace | *Rhinichthys cataractae* | R | C | A, C, U | C | C | A | A, C | A | | A, C, U | A |
| River carpsucker | *Carpiodes carpio* | C, U | | | C | | C | C | U, R | | U, R | |
| Longnose sucker | *Catostomus catostomus* | A, C, U | A | C, U | A, C | C | C | A | C | C | A, C, U, R | C |
| White sucker | *Catostomus commersoni* | A, C, U | | A, U | A | A | C | A, C | A, C | C | A, C, U | A, C |
| Mountain sucker | *Catostomus platyrhynchus* | A, U | C | C, R | C | A | A | C | | P | A, C | C |
| Smallmouth buffalo | *Ictiobus bubalus* | | | | | | R | R | | | R | |
| Bigmouth buffalo | *Ictiobus cyprinellus* | | | | | | R | R | | | | |

## TABLE WIL-3
## COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES ND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS RESOURCE MANAGEMENT PLAN AREA[1]

| | | | | | Clarks Fork of the Yellowstone | | | Bighorn River | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Yellowstone River West of Billings** | **Boulder River** | **Stillwater River** | **Downstream Section** | **Upstream Section** | **Yellowstone River East of Billings** | **Downstream Section** | **Upstream Section** | **Little Bighorn River** | **Musselshell River** | **Careless Creek** |
| Shorthead redhorse | *Moxostoma macrolepidotum* | A, C | | | U | | A | A, C | U, R | | A, C | C |
| Black bullhead[2] | *Ameiurus melas* | U | | | | | | | | | R | |
| Yellow bullhead[2] | *Ameiurus natalis* | | | | | | U | | | | | |
| Channel catfish | *Ictalurus punctatus* | C, U, R | | | U, R | | A | C, U | R | C | C, U | |
| Stonecat | *Noturus flavus* | U | | | C | | C | U | | | C, U, R | |
| Northern pike[2] | *Esox lucius* | | | | | | R | R | R | | U, R | |
| Yellowstone cutthroat trout | *Oncorhynchus clarki bouvieri* | R | C, U | C, U, R | R | R | | | | | | |
| Rainbow trout[2] | *Oncorhynchus mykiss* | C | A, C, U | A, C, U | U, R | R | U | C, U | A | C | | |
| Mountain whitefish | *Prosopium williamsoni* | A, C | A | A, C, U | C | A | U | U | C | C | C, U | |
| Brown trout[2] | *Salmo trutta* | C | A | A, C, U | R | U | U | C, U | A | C | C, R | |
| Brook trout[2] | *Salvelinus fontinalis* | R | A, U | C, U, R | | | | | | | | C |
| Arctic grayling | *Thymallus arcticus* | | | | | R | | | | | | |
| Burbot | *Lota lota* | C, U, R | | | C | | C | C, U | R | | | |
| Plains killifish | *Fundulus zebrinus* | | | | | | | R | | | | |
| Mottled sculpin | *Cottus bairdi* | A, C, U | C | | R | | | | | | A, C | |
| Green sunfish[2] | *Lepomis cyanellus* | | | | | | | R, I | | | R, I | |
| Smallmouth bass[2] | *Micropterus dolomieu* | | | | | | C | U, R | R | C | C, U, R | |
| Largemouth bass[2] | *Micropterus salmoides* | | | | | | R | | | | I | |

## TABLE WIL-3
## COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES ND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS RESOURCE MANAGEMENT PLAN AREA[1]

| Common Name | Scientific Name | Yellowstone River West of Billings | Boulder River | Stillwater River | Clarks Fork of the Yellowstone | | Yellowstone River East of Billings | Bighorn River | | Little Bighorn River | Musselshell River | Careless Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Downstream Section | Upstream Section | | Downstream Section | Upstream Section | | | |
| Black crappie[2] | *Pomoxis nigromaculatus* | | | | | | I | I | | | I | |
| Yellow perch[2] | *Perca flavescens* | | | | | | R | R | | | U | |
| Sauger | *Stizostedion canadense* | U | | | R | | U | U | R | | C, U | |
| Walleye[2] | *Stizostedion vitreum* | | | | | | R | U | R | | R | |
| Freshwater drum | *Aplodinotus grunniens* | | | | | | R | R | | | R | |

[1] Information derived from the Montana Natural Resource Information System on the Internet at http://nris.state.mt.us/wis/mris1.html. Multiple values for relative abundance indicate variation among river reaches and/or study results within a given drainage. Relative abundance: A = abundant; C = common; U = uncommon; R = rare; I = incidental; P = present.

[2] Indicates species is not native.

## TABLE WIL-4

## COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE POWDER RIVER RESOURCE MANAGEMENT PLAN AREA[1]

| | | | | Tongue River | | | Powder River | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Yellowstone River** | **Rosebud Creek** | **Downstream Section** | **Upstream Section** | **Pumpkin Creek** | **Downstream Section** | **Upstream Section** | **Little Powder River** | **Little Missouri River** |
| Pallid sturgeon | *Scaphirhynchus albus* | R | | | | | | | | |
| Shovelnose sturgeon | *Scaphirhynchus platorynchus* | A | | A | | | A | A | | |
| Paddlefish | *Polyodon spathula* | C | | R | | | | | | |
| Goldeye | *Hiodon alasoides* | A | U | A | | U, R | C | C | C | U |
| Lake chub | *Couesius plumbeus* | R | U | | | C, U | | | | C |
| Common carp[2] | *Cyprinus carpio* | A | C | C | C | C, U | R | C, U, R | U | U |
| Western silvery/plains minnow | *Hybognathus argyritis/placitus* | C, U | | U | | C | A | A, C | A | C |
| Brassy minnow | *Hybognathus hankinsoni* | R | R | | | C | R | R | | |
| Sturgeon chub | *Macrhybopsis gelida* | U, R | | R | | | C | C | | |
| Golden shiner[2] | *Notemigonus crysoleucas* | | | | | | | | | C |
| Emerald shiner | *Notropis atherinoides* | A | | C | C | | | | | |
| Sand shiner | *Notropis stramineus* | R | | R | | C | U | U | U | A |
| Northern redbelley/finescale dace | *Phoxinus eos/neogaeus* | U | | | | | | | | |
| Fathead minnow | *Pimephales promelas* | C | U | C | | A, C | C | | C | C |
| Flathead chub | *Platygobio gracilis* | A | A | A | A | C, U | A | A | R | A |
| Longnose dace | *Rhinichthys cataractae* | U | C | C | U | U | U | C, U | R | C |
| Creek chub | *Semotilus atromaculatus* | R | | R | R | | R | R | | C |
| River carpsucker | *Carpiodes carpio* | A | U | C | C | C, R | U | U | C | U |
| Longnose sucker | *Catostomus catostomus* | C | U | C | A | | | | | |

## TABLE WIL-4
## COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE POWDER RIVER RESOURCE MANAGEMENT PLAN AREA[1]

| | | | | Tongue River | | | Powder River | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Yellowstone River** | **Rosebud Creek** | **Downstream Section** | **Upstream Section** | **Pumpkin Creek** | **Downstream Section** | **Upstream Section** | **Little Powder River** | **Little Missouri River** |
| White sucker | *Catostomus commersoni* | A | C | C | A | C, U | C | | U | C |
| Mountain sucker | *Catostomus platyrhynchus* | U | | U | C | R | | | | |
| Blue sucker | *Cycleptus elongatus* | | | U | | | | | | |
| Smallmouth buffalo | *Ictiobus bubalus* | C | | U | C | | | | | |
| Bigmouth buffalo | *Ictiobus cyprinellus* | C | | U | | | | | | |
| Shorthead redhorse | *Moxostoma macrolepidotum* | A | A | A | A | C, U | U | C, U | A | A |
| Black bullhead[2] | *Ameiurus melas* | | R | U | U | U | | | | U |
| Yellow bullhead[2] | *Ameiurus natalis* | | | U | U | | | | | |
| Channel catfish | *Ictalurus punctatus* | A | C | A | C | C, U | C | C, U | C | C |
| Stonecat | *Noturus flavus* | A | U | C | C | U, R | U | U | U | |
| Northern pike[2] | *Esox lucius* | U | C | U | U | | | | | |
| Rainbow trout[2] | *Oncorhynchus mykiss* | R | | | U | | R | U, R | | |
| Mountain whitefish | *Prosopium williamsoni* | | U | | U | | | | | |
| Brown trout[2] | *Salmo trutta* | R | | | U | | | U | | |
| Brook trout[2] | *Salvelinus fontinalis* | | U | | | | | U | | |
| Burbot | *Lota lota* | A | C | U | | | R | R | | |
| Plains killifish | *Fundulus zebrinus* | | | | | | | | | U |
| Rock bass[2] | *Ambloplites rupestris* | R | | U | C | | | | | |
| Green sunfish[2] | *Lepomis cyanellus* | R | | | U | U | R | R | U | U |
| Pumpkinseed[2] | *Lepomis gibbosus* | R | | U | U | U | | | | |

## TABLE WIL-4
## COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE POWDER RIVER RESOURCE MANAGEMENT PLAN AREA[1]

| | | | | **Tongue River** | | | **Powder River** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Yellowstone River** | **Rosebud Creek** | **Downstream Section** | **Upstream Section** | **Pumpkin Creek** | **Downstream Section** | **Upstream Section** | **Little Powder River** | **Little Missouri River** |
| Smallmouth bass[2] | *Micropterus dolomieu* | R | | | | | | | | |
| Largemouth bass[2] | *Micropterus salmoides* | R | | | | | | | | |
| White crappie[2] | *Pomoxis annularis* | U | R | U | U | U | | | | |
| Black crappie[2] | *Pomoxis nigromaculatus* | U | | R | R | | | | | |
| Yellow perch[2] | *Perca flavescens* | U | | U | | | | | | |
| Sauger | *Stizostedion canadense* | A | C | C | C | R | A | A, U | | U |
| Walleye[2] | *Stizostedion vitreum* | C, U | U | U | C | | R | R | | |
| Freshwater drum | *Aplodinotus grunniens* | U | | | | | | | | |

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[1] Information derived from the Montana Natural Resource Information System on the Internet at http://nris.state.mt.us/wis/mris1.html. Multiple values for relative abundance indicate variation among river reaches and/or study results within a given drainage. Relative abundance: A = abundant; C = common; U = uncommon; R = rare; I = incidental; P = present.

[2] Indicates species is not native.

## TABLE WIL-5
## COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN PARK, GALLATIN, AND BLAINE COUNTIES[1]

| | | Park County | | Gallatin County | | | | Blaine County | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Yellowstone River** | **Shields Creek** | **Missouri River** | **Gallatin River** | **Madison River** | **Jefferson River** | **Missouri River** | **Cow Creek** | **Milk River** | **Lodge Creek** | **Peoples Creek** |
| Pallid sturgeon | *Scaphirhynchus albus* | | | | | | | R | | | | |
| Shovelnose sturgeon | *Scaphirhynchus platorynchus* | | | | | | | C | | | | |
| Paddlefish | *Polyodon spathula* | | | | | | | U | | | | |
| Goldeye | *Hiodon alasoides* | | | | | | | C | | C | | |
| Lake chub | *Couesius plumbeus* | | | | | | | U | | C | C | |
| Common carp[2] | *Cyprinus carpio* | R | | A | | U | C | C | | C | C | U |
| Utah chub[2] | *Gila atraria* | | | | | U | | | | | | |
| Western silvery/plains minnow | *Hybognathus argyritis/placitus* | | | | | | | C | C | U | C | C, U |
| Brassy minnow | *Hybognathus hankinsoni* | | | | | | | | | R | | |
| Sturgeon chub | *Macrhybopsis gelida* | | | | | | | U | | | | |
| Pearl dace | *Margariscus margarita* | | | | | | | | | | U | |
| Emerald shiner | *Notropis atherinoides* | | | | | | | C | | C | U | |
| Spottail shiner[2] | *Notropis hudsonius* | | | | | | | | | U | | |
| Northern redbelley/finescale dace | *Phoxinus eos/neogaeus* | | | | | | | | | C | U | C |
| Fathead minnow | *Pimephales promelas* | | | | | | | U | C | C,U | A | |
| Flathead chub | *Platygobio gracilis* | | | A | | | U | A, C | | C | | C |
| Longnose dace | *Rhinichthys cataractae* | C, U | C, U | C | U | A | C | C | C | C | U | C |
| Redside shiner | *Richardsonius balteatus* | | | | | | U | | | | | |
| River carpsucker | *Carpiodes carpio* | | | | | | | C | | U | | |
| Longnose sucker | *Catostomus catostomus* | A, C | A, U | C | C | A | C | C | C | U | R | U |

## TABLE WIL-5
## COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN PARK, GALLATIN, AND BLAINE COUNTIES[1]

| | | Park County | | Gallatin County | | | | Blaine County | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Yellowstone River** | **Shields Creek** | **Missouri River** | **Gallatin River** | **Madison River** | **Jefferson River** | **Missouri River** | **Cow Creek** | **Milk River** | **Lodge Creek** | **Peoples Creek** |
| White sucker | *Catostomus commersoni* | A, C | A, U | C | C | A | C | | C | A | C | A, C |
| Mountain sucker | *Catostomus platyrhynchus* | U, R | C | R | U | U | R | | R | | | R |
| Blue sucker | *Cycleptus elongatus* | | | | | | | U | | | | |
| Smallmouth buffalo | *Ictiobus bubalus* | | | | | | | C | | U | | |
| Bigmouth buffalo | *Ictiobus cyprinellus* | | | | | | | U | | U | | |
| Shorthead redhorse | *Moxostoma macrolepidotum* | U, R | | | | | | C | | U | | |
| Black bullhead[2] | *Ameiurus melas* | | | | | | | | | A, C | C | |
| Channel catfish | *Ictalurus punctatus* | | | | | | | A | | U | | |
| Stonecat | *Noturus flavus* | | | U | | U | | C | | C | U | |
| Northern pike[2] | *Esox lucius* | | | | | | | U | | C | C | U |
| Cisco[2] | *Coregonus artedi* | | | | | | | U | | | | |
| Lake whitefish[2] | *Coregonus clupeaformis* | | | | | | | | | C | R | |
| Yellowstone cutthroat trout | *Oncorhynchus clarki bouvieri* | C, U | C, U, R | | R | | | | | | | |
| Westslope cutthroat trout | *Oncorhynchus clarki lewisi* | | | | R | | | | | | | |
| Rainbow trout[2] | *Oncorhynchus mykiss* | C | R | C | A | A, U | U | | | I | | U |
| Mountain whitefish | *Prosopium williamsoni* | A | A, C | A | A | C | A | | | | | |
| Brown trout[2] | *Salmo trutta* | C | C, U | C | A, C, U | U | C | | | | | |
| Brook trout[2] | *Salvelinus fontinalis* | R | U | | U | R | | | A | | | C |
| Arctic grayling | *Thymallus arcticus* | | | | R | | | | | | | |
| Burbot | *Lota lota* | | | U | | | U | U | | C, R | | |

## TABLE WIL-5
## COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN PARK, GALLATIN, AND BLAINE COUNTIES[1]

| | | **Park County** | | **Gallatin County** | | | | **Blaine County** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Yellowstone River** | **Shields Creek** | **Missouri River** | **Gallatin River** | **Madison River** | **Jefferson River** | **Missouri River** | **Cow Creek** | **Milk River** | **Lodge Creek** | **Peoples Creek** |
| Brook stickleback | *Culaea inconstans* | | | | | | | | | R | C | U |
| Mottled sculpin | *Cottus bairdi* | A | A, C | C | A, C | A | C | | C | | | C |
| Smallmouth bass[2] | *Micropterus dolomieu* | | | | | | | | | U | | |
| Largemouth bass[2] | *Micropterus salmoides* | | | R | | | | | | | | |
| Black crappie[2] | *Pomoxis nigromaculatus* | | | | | | | | | U | | |
| Iowa darter | *Etheostoma exile* | | | | | | | | | U | | |
| Yellow perch[2] | *Perca flavescens* | | | | | R | | | | C | C | |
| Sauger | *Stizostedion canadense* | | | | | | | C | | C | U | |
| Walleye[2] | *Stizostedion vitreum* | | | | | | | U | | C | U | U |
| Freshwater drum | *Aplodinotus grunniens* | | | | | | | U | | | | |

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[1] Information derived from the Montana Natural Resource Information System on the Internet at http://nris.state.mt.us/wis/mris1.html. Multiple values for relative abundance indicate variation among river reaches and/or study results within a given drainage. Relative abundance: A = abundant; C = common; U = uncommon; R = rare; I = incidental; P = present.

[2] Indicates species is not native.

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# CBM Programmatic Wildlife Monitoring and Protection Plan
# for the
# Statewide Final Oil and Gas Environmental Impact Statement
# and
# Proposed Amendment of the Powder River and Billings Resource Management Plans

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## INTRODUCTION

This Wildlife Monitoring and Protection Plan (WMPP) was prepared in conjunction with the *Statewide Oil and Gas Draft Environmental Impact Statement (DEIS) (BLM 2001 Montana DEIS) and Amendment of the Powder River and Billings Resource Management Plans (RMPs).* The DEIS and Amendment addresses future exploration for and development of Bureau of Land Management (BLM) and state of Montana (state) managed coalbed methane gas (CBM) resources and conventional oil and gas resources. The planning area excludes those lands administered by the Forest Service, the Crow, Northern Cheyenne, and other Indian lands. The WMPP will be implemented on federal lands, including split estate, in cooperation with state agencies, federal agencies, tribal representatives, Operators, and landowners. If owners and managers of state and private mineral development are willing to incorporate this guidance into management of their CBM activities, they may become a partner by entering into a Cooperative Agreement.

A variety of planning issues related to wildlife were identified during preparation of the DEIS. The goal of the WMPP is to avoid or minimize impacts to wildlife and serve as a communication tool to foster cooperative relationships among the CBM and conventional Oil and Gas industry (i.e., Operators), resource management agencies, landowners and adjacent Tribal Governments. Because this plan addresses a large geographic area composed of diverse wildlife habitats and unique situations, it must be programmatic in nature. However, the need to provide management recommendations and guidance to conserve species and habitats remains. Regional or site specific monitoring and protection plans which follow the guidance provided in this programmatic document will be required as part of each CBM Project Plan. Implementation of this plan during the course of project development and operations should promote wildlife conservation and allow land managers and project personnel to maintain wildlife populations and productivity levels simultaneously with the development of natural oil and gas resources.

## PLAN PURPOSE

Oil and gas leasing decisions and lease stipulations were previously analyzed in the Bureau of Land Management (BLM) 1992 *Final Oil and Gas RMP/EIS Amendment* (BLM 1992). Wildlife stipulations attached to leases offer protective measures: 1) for certain species, 2) during a particular time period, or 3) within a specific area. These stipulations may not address other concerns related to special status species or water/habitat related issues caused by direct and indirect impacts from CBM exploration and development. Because it is purely speculative to predict how all wildlife will react or how development will proceed, it is difficult to develop prescriptive mitigation standards across the entire planning area. Even though BLM has some adaptive management strategies in place (e.g., conditions of approval and compliance inspections), these mechanisms do not give us the information necessary to understand cause and effect relationships across a landscape. Therefore, the purpose of this Plan is to acquire baseline wildlife information, monitor populations, and assess stipulations for effectiveness. The WMPP will facilitate our ability to pinpoint problems (including the evaluation of other contributing factors), design Project Plans which include conservation for declining species, monitor the effectiveness of decisions, and make recommendations to adjust management to address specific situations.

## AREA AND OBJECTIVES

The WMPP document is the framework for wildlife monitoring and protection across the Powder River and Billings Resource Management Plan areas (approximately 6.5 million acres) and provides a template for regional and/or project specific WMPP development. The BLM, Montana Fish Wildlife and Parks (MFWP), and United States Fish and Wildlife Service (FWS) will enter into a Cooperative Agreement to work cooperatively to implement portions of the WMPP over the planning area. Specific geographic areas will be delineated as Regional Monitoring Units

(RMU). As energy development begins, RMU specific WMPPs, following the same template as this document, will be written in cooperation with other agencies, Operators, landowners and other interests. The objectives of the program are to:

- Establish a framework for cooperation among agencies, Operators, landowners, Tribal Governments and interest groups;
- Provide a process for data collection, data management and reporting ;
- Determine needs for inventory, monitoring and protection measures;
- Provide guidance and recommendations for the conservation of wildlife species;
- Establish protocols for biological clearances of Special Status Species;
- Meet the terms and conditions of the Biological Opinion;
- Determine if management practices to conserve wildlife species and habitat in lease stipulations and conservation measures contained in the BLM Record of Decision, CBM Project Plans or Oil and Gas APDs are meeting specified objectives;
- Develop recommendations to adjust management actions based on field observations and monitoring.

Implementation of the WMPP will begin with the issuance of the *Record of Decision* and will remain in effect for the life of the project (approximately 25 years). Guidance for the conservation of special status species will be incorporated into the "Project Plan of Development Preparation Guide." Signatories on an Interagency Cooperative Agreement will serve as the "*Steering Committee.*" A "*Core Team*" (i.e., agency biologists) will oversee the implementation of the programmatic elements of the WMPP. As energy development is initiated in an identified RMU, Wildlife Monitoring Review Teams (i.e., RMU Team) consisting of resource specialists from the BLM, FWS, MFWP and applicable Operator funded biologists will write area-specific monitoring and protection plans. Resource specialists may serve as members on more than one RMU project area team. Individual RMU plans may be terminated at the end of any year when there is undeniable evidence illustrating that wildlife populations and productivity have been successfully maintained. The BLM Authorized Officer (AO) would base termination on recommendations from the *RMU Team.*

The programmatic template will undergo a major review for effectiveness every 5 years, or as determined by the *Core Team* and *RMU Team* members. A cooperative agreement among cooperators will be signed on an annual basis to include specific work components of the current year's work.

## IMPLEMENTATION PROTOCOL

This section provides preliminary wildlife inventory, monitoring, and protection protocol. Required actions for inventory, monitoring and protection vary by species and development intensity. In areas of development with > 4 well locations per section, additional actions in Table 3 become applicable. Standard protocol for Application for Permit to Drill (APD) and right-of-way (ROW) application field reviews are provided in Table 2. Alternative measures and protocols will be developed as determined by *Core Team* and *RMU Team* members in response to specific needs identified in annual reports. This document provides methods for a number of wildlife species/categories. Additional species/categories may be added based on needs identified in annual wildlife reports. The wildlife species/categories for which specific inventory, monitoring, and protection procedures will be applied were developed based on input provided by the public, other agencies, and the BLM during preparation of the DEIS.

Considerable efforts will be required by agency and operator personnel for plan implementation. Many of the annually proposed agency data collection activities are consistent with current agency activities. Additionally, agency cost-sharing approaches will be considered such that public demands and statutory directives are achieved.

## ANNUAL REPORTS AND MEETINGS

State and federal agencies will enter into a master Cooperative Agreement to implement the programmatic elements of inventory, monitoring and protection actions associated with CBM development in the Powder River and Billings Resource Management Plan areas. A *Core Team* will oversee implementation across the planning area and summarize information from work achieved in various RMUs. Additional cooperative agreements with cooperators will be established as activity is initiated in a RMU.

During project development (i.e., 25 years), Operators will provide an updated inventory and description of all existing project features (i.e., location, size, and associated level of human activity at each feature), as well as those tentatively proposed for development during the next 12 months. Operators should submit the inventory to BLM no later than October 15 of each calendar year. These data will be coupled with annual wildlife inventory, monitoring, and protection data obtained for the previous year and included in annual reports. Annual reports will be prepared by the BLM. Annual wildlife inventory, monitoring, and protection data gathered by parties other than the BLM, (e.g., Operators, MFWP) should provide the data to the BLM by October 15 of each calendar year. Upon receipt of these data, annual reports will be completed in draft form by the BLM and submitted to the Operators, USFWS, MFWP, and other interested parties no later than November 15 of each year. A 1-day meeting of the *RMU Teams* and *Core Team* will be organized by the BLM and held in early December of each year to discuss and modify, as necessary, proposed wildlife inventory, monitoring, and protection protocol for the subsequent year. Additional meetings specific to a RMU will be scheduled as necessary.

Discussions regarding annual Operator-specific financing and personnel requirements will be made at these meetings. A formula for determining these requirements will be developed at the first year's meeting (i.e., size of development, anticipated impacts, amount of public land, etc.). A protocol regarding how to accommodate previously unidentified development sites will also be determined during the annual meeting. Final decisions will be made by the BLM based on the input of all affected parties.

A final annual report will be issued by BLM to all potentially affected individuals and groups by early February of each year. Annual reports will summarize annual wildlife inventory and monitoring results, note any trends across years, identify and assess protection measures implemented during past years, specify monitoring and protection measures proposed for the upcoming year, and recommend modifications to the existing WMPP based on the effectiveness and/or ineffectiveness of past years (i.e., identification of additional species/categories to be monitored). Where possible, data presented in reports will be used to identify potential correlations between development and wildlife productivity and/or abundance. The BLM will be the custodian of the data and stored in BLM's Geographic Information System (GIS) for retrieval, and planning. Annual GIS data updates will be conducted. Raw data collected each year will be provided to other management agencies (e.g., USFWS, MFWP) at the request of these agencies. In addition, sources of potential disturbance to wildlife will be identified, where practical (e.g., development activities, weather conditions, etc.).

Additional reports may be prepared in any year, as necessary, to comply with other relevant wildlife laws, rules, and regulations (e.g., black-footed ferret survey reports, mountain plover and bald eagle habitat loss reports).

## ANNUAL INVENTORY AND MONITORING

This document outlines the inventory and monitoring protocol for a number of selected wildlife species/categories. Protocol will be unchanged except as authorized by the BLM or specified in this plan. Additional wildlife species/categories and associated surveys may be added or wildlife species/categories and surveys may be omitted in future years, depending on the results presented in the coordinated review of annual wildlife reports. The MFWP will be contacted during the coordination of survey and other data acquisition phases. Opportunistic wildlife observations may be made throughout the year by agency and Operator personnel.

The frequency of inventory and monitoring will be dependent upon the level of development. In general, inventory and monitoring frequency will increase with increased levels of development. The level of effort should also be determined by species presence and development projection. Inventory and monitoring results may lead to further currently unidentifiable studies (i.e., cause and effect). The following sections identify the level of effort required by the WMPP. Site and species-specific surveys will continue to be conducted in association with APD and ROW application or CBM project field reviews.

## Raptors (Including Bald Eagle and Burrowing Owl)

Raptor inventories will be conducted over the entire CBM project area every 5 years by BLM and MFWP. In potentially affected areas, baseline inventory should be conducted prior to the commencement of development to determine the location of raptor nests/territories and their activity status by the BLM, with Operator financial assistance. These inventories should be repeated every 5 years (in areas with < 4 well locations/section) thereafter for the Life-of-the-Project (LOP) to monitor trends in habitat use. These surveys may be implemented aerially (e.g., via helicopter) or from the ground. Operators may provide financial assistance for some work. Data collected during the surveys will be recorded on BLM approved data sheets and entered into the BLM GIS database.

Nest productivity monitoring will be conducted by the BLM or a BLM approved biologist. Active nests located within 1 mile of project-related disturbance areas will be monitored between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings per nest). These surveys generally will be conducted from the ground. However, some nests may be difficult to observe from the ground due to steep and rugged topography and may require aerial surveys. Operators may provide financial assistance for aircraft rental as necessary. Attempts will be made to determine the cause of any documented nest failure (e.g., abandonment, predation).

Additional raptor nest activity and productivity monitoring measures will be applied in areas with high levels of development (i.e., areas with ≥ 4 well locations/section) on and within 1 mile of the project area. Inventory/monitoring efforts in these areas, as well as selected undeveloped reference areas will be conducted annually during April and May, followed by nest productivity monitoring. Site and species-specific nest inventories will also continue to be conducted as necessary in association with all APD and ROW application field reviews.

All raptor nest/productivity surveys will be conducted using procedures that minimize potential adverse effects to nesting raptors. Specific survey protocol for reducing detrimental effects are listed in Grier and Fyfe (1987) and Call (1978) and include the following:

- Nest visits will be delayed for as long as possible during the nesting season.
- Nests will be approached cautiously, and their status (i.e., number of nestling/fledglings) will be determined from a distance with binoculars or a spotting scope.
- Nests will be approached tangentially and in an obvious manner to avoid startling adults.
- Nests will not be visited during adverse weather conditions (e.g., extreme cold, precipitation events, windy periods, or during the hottest part of the day).
- Visits will be kept as brief as possible.
- All inventories will be coordinated by the BLM.
- The number of nest visits in any year will be kept to a minimum.

**Ferruginous Hawk**: Timing of surveys is very important in documenting the territory, occupancy, success and productivity of ferruginous hawk populations. The accepted survey and monitoring guidelines for ferruginous hawk are taken from the *Survey and Monitoring Guidelines for Ferruginous Hawks in Montana, 1995.*

**Bald Eagle:** Inventory and monitoring protocol for the bald eagle will be as described for raptors, with the following additions. Operators will indicate the presence of eagle habitat as previously defined, on their application. Prior to CBM development or construction, surveys of the wooded riparian corridors within 1.0 mile of a project area will be conducted in the winter and/or spring by biologists and/or BLM-approved biologists to determine the occurrence of winter bald eagle roosts. Surveys will be conducted from daybreak to 2 hours after sunrise and/or from 2 hours before sunset to 1 hour after sunset by fixed-wing aircraft. Follow-up ground surveys, if necessary, will be conducted during the same time frame. Surveys will be at least 7 days apart. The location, activity, number, and age class (immature, mature) of any bald eagles observed will be recorded. If a roost or suspected roost is identified, BLM, USFWS, and MFWP will be notified and a GPS record of the roost/suspected roost will be obtained and entered into the BLM GIS database. There will be No Surface Occupancy within 0.5 miles of any identified bald eagle roost sites.

Nest productivity will be conducted by the BLM or a BLM-approved biologist in areas with high levels of development (i.e., areas with greater than or equal to 4 well locations/section) on and within 1 mile of the project area. Active nests located within one mile of project-related disturbance areas will be monitored between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings per nest).

**Burrowing owl:** Operators should indicate the presence of prairie dog towns on their application. The presence of sensitive habitat does not indicate that a species may be present. It does, however, alert the company and BLM that a field review and surveys may be required to process the permit or initiate action. In association with APD and ROW application field reviews, prairie dog colonies within 0.5 miles of a proposed project area will be surveyed for western burrowing owls by BLM biologists or a BLM-approved Operator-financed biologist twice yearly from June through August to determine the presence/absence of nesting owls. Efforts will be made to determine reproductive success (no. of fledglings/nest).

## Threatened, Endangered, Candidate, and Other Species of Concern

Operators should indicate the presence of cottonwood riparian, herbaceous riparian or wet meadows, permanent water or wetlands, prairie dog towns, or rock outcrops, ridges or knolls on their application. The presence of sensitive habitat may not indicate that a species may be present. It does, however, alert the company and BLM that a field review and surveys may be required to process the permit or initiate action. The level of effort associated with the inventory and monitoring required for threatened, endangered, candidate, and other species of concern (TEC&SC) will be commensurate with established protocol for the potentially affected species. Methodologies and results of these surveys will be included in annual reports or provided in separate supplemental reports. As TEC&SC species are added to or withdrawn from USFWS and/or BLM lists, appropriate modifications will be incorporated to this plan and specified in annual reports.

TEC&SC data collected during the surveys will be provided only as necessary to those requiring the data for specific management and/or project development needs. Site- and species-specific TEC&SC surveys will continue to be conducted as necessary in association with all APD and ROW application field reviews. Data will be collected on BLM approved data sheets and entered into the BLM GIS database.

## Black-footed Ferret

Operators should indicate the presence of prairie dog towns on their application. The presence of sensitive habitat does not indicate that suitable black footed ferret habitat may be present. It does, however, alert the company and BLM that a field review and surveys may be required to process the permit or initiate action. BLM biologists and/or BLM-approved Operator-financed biologists will determine the presence/absence of prairie dog colonies within 0.5 miles of proposed activity during APD and ROW application field reviews. Prairie dog colonies on the area will be mapped to determine overall size following the approved methodology. Colony acreage will be determined using GIS applications. Colonies that meet USFWS size criteria as potential black-footed ferret habitat (USFWS 1989) will be surveyed to determine active burrow density using the methods described by Biggins et al. (1993) or other BLM- and USFWS-approved methodology.

Project activity will be located to avoid impacts to prairie dog colonies that meet USFWS criteria as black-footed ferret habitat (USFWS 1989). If avoidance is not possible, all colonies meeting the USFWS size criteria and any colonies for which density estimates are not obtained will be surveyed for black-footed ferrets by an operator-financed, USFWS-certified surveyor prior to but not more than 1 year in advance of disturbance to these colonies. Black-footed ferret surveys will be conducted in accordance with USFWS guidelines (USFWS 1989) and will be conducted on a site-specific basis, depending on the areas proposed for disturbance in a given year as specified in the annual report. If a black-footed ferret or its sign is found during a survey, all development activity would be subject to recommendations from the *Montana Black-footed Ferret Survey Guidelines*, *Draft Managing Oil and Gas Activities in Prairie Dog Ecosystems with Potential for Black-footed ferret Reintroduction* and re-initiation of Section 7 Consultation with USFWS.

## Black-tailed Prairie Dog

The BLM will determine the acreage of occupied black-tailed prairie dog habitat within suitable mountain plover habitat on federally managed surface acres and federal mineral estate lands. Further, a reasonable effort should be made to estimate actual impacts, including habitat loss, CBM development will have on occupied black-tailed prairie dog acres within suitable mountain plover habitat over the entire project area.

Active prairie dog towns on BLM lands within 0.5 miles of a specific project area will be identified, mapped, and surveyed as described in the Black-footed ferret section. In addition, reference prairie dog colonies subject to development will be identified. On an annual basis, the BLM and/or a BLM-approved Operator-financed biologist will survey, at least a portion of, the prairie dog colonies, including the reference colonies. Prairie dog populations are subject to drastic population fluctuations primarily due to disease (plague). Therefore, efforts will be made to compare the data from the reference colonies with that obtained from the project areas, in order to monitor the response of prairie dog populations to CBM development.

## Mountain Plover

Surface use is prohibited within 1/4 mile of active mountain plover nest sites. Disturbance to prairie dog towns will be avoided where possible. Any active prairie dog town occupied by mountain plover will have No Surface Use between April 1 and July 31which may be reduced to No Surface Use within 1/4 mile of an active nest, once nesting has been confirmed. An exception may be granted by the authorized officer after the BLM consults with the FWS on a case-by-case basis and the operator agrees to adhere to the new operational constraints.

On federally managed surface acres, active black-tailed prairie colonies within suitable mountain plover habitat will have a No Surface Occupancy.

Prior to permit approval, habitat suitability will be determined. The BLM, FWS and MFWP will estimate potential mountain plover habitat across the CBM area using a predictive habitat model. Over the next 5 years, information will be refined by field validation using most current Service mountain plover survey guidelines (USFWS 2002c) to determine the presence/absence of potentially suitable mountain plover habitat. In areas of suitable mountain plover habitat, surveys will be conducted prior to ground disturbance activities by the BLM or a BLM-approved Operator biologist using the Service protocol at a specific project area plus a 0.5 mile buffer. Efforts will be made to identify mountain plover nesting areas that are not subject to CBM development to be used as reference sites. Comparisons will be made of the trends in mountain plover nesting occupancy between these reference areas and areas experiencing CBM development.

The BLM shall monitor all loss of mountain plover habitat associated with all portions of this action (operators will indicate the presence of prairie dog towns or other mountain plover habitat indicators on their application). Suitable mountain plover habitat has been defined under 'critical habitat' for the mountain plover in the Biological Opinion. The actual measurement of disturbed habitat can be the responsibility of the BLM, their agent (consultant, contractor, etc) with a written summary provided to the Service's Montana Field Office upon project completion, or immediately if the anticipated impact area is exceeded.

## Gray Wolf

According to the *Biological Assessment for Coalbed Methane Production in Montana*, state lands and counties (Gallatin and Park Counties) bordering Yellowstone National Park would be surveyed in the spring for wolves, occupied dens, or scat prior to development. These surveys could be conducted from the air or from the ground. Areas in which wolves are observed would continue to be surveyed annually until reintroduction objectives are met. Efforts will be made to compare production and/or occupancy trends in wolf populations in these areas to a reference population in order to gain more reliable information regarding the response of wolves to CBM development.

## Sage Grouse

BLM and MFWP will conduct sage grouse lek inventories over the entire CBM project area every 5 years to determine lek locations. Surveys of different areas may occur during different years with the intent that the entire CBM project area will be covered at least once every 5 years. Existing MFWP Region 7 trend blocks will be monitored annually. There are 4 trend blocks in FWP Region 7; one located in the Decker area and 3 others across the Region. Inventories and protocol will be consistent with the *Montana Sage Grouse Conservation Plan* coordinated by the BLM and MFWP. In areas with $\geq$ 4 well locations per section, aerial inventories will be conducted annually on affected sections, 2 mile buffers, and selected undeveloped reference areas. Surveys may be conducted aerially or on the ground, as deemed appropriate by the BLM and MFWP. Operator may provide financial assistance.

Aerial surveys will be used for determining lek locations. BLM, MFWP or BLM-approved Operator-financed biologist will monitor sage grouse lek attendance within 2 miles of areas having < 4 locations per section such that all leks on these areas are surveyed at least once every 3 years. Data collected during these surveys will be recorded on BLM and MFWP approved data sheets and entered into the BLM GIS database. An effort should also be made to compare trends of the number of males/lek to reference leks

Sage grouse winter use surveys of suitable winter habitat within 2 miles of a project area will be coordinated by the BLM and implemented by the BLM and/or MFWP during November through February as deemed appropriate by these management agencies, and results will be provided in interim and/or annual reports. These surveys will be conducted to identify sage grouse wintering concentration areas. Historical information of winter sage grouse locations will be useful in focusing efforts in areas suspected of providing winter habitat. Sage grouse winter habitat use surveys will be conducted subsequent to snowfall events to identify crucial winter habitat.

## Big Game

Elk, mule deer, white-tailed deer, and pronghorn are the common big game species that occur within parts or all of the CBM planning area. BLM and MFWP will continue to collect annual big game seasonal habitat use data and make it available to Operators and landowners. Big game use of seasonal habitats is highly dependent upon a combination of environmental factors including forage quality and snow depth. Therefore, it is very difficult to attribute changes in habitat use to a single factor. Comparisons in trends between big game seasonal habitat reference areas and seasonal habitats associated with CBM development may provide some insight into the response of big game to CBM development.

## General Wildlife

Any avian mortality observed in pits will be documented, reported to the BLM and USFWS, and measures will be taken to prevent future mortality at the pit(s). Well field access roads and other roads with project-related traffic increases will be monitored for wildlife mortality so that specific mitigation can be designed and implemented as deemed necessary by BLM, in consultation with MFWP, for areas with high traffic volume and/or increased wildlife/vehicle collisions and mortality.

## Aquatic Species

Baseline aquatic inventories will be conducted in potentially affected areas by BLM and MFWP with Operator financial assistance, for 1-2 years prior to development commencing, to determine occurrence, abundance, and population diversity of the aquatic community. These inventories should be repeated every year in selected intermittent/perennial streams associated with produced water discharge as well as selected intermittent/perennial streams associated with no produced water discharge (control sample site) .

Natural fluctuations in species occurrence, abundance, and population diversity will be determined by comparing changes in control sample sites to baseline inventories. Changes in occurrence, abundance, and population diversity of the aquatic community in streams associated with produced water discharge may then be possible by comparing to the natural fluctuations.

Detection of a retraction in the range of a species, a downward trend in abundance, or reduced population diversity in systems with produced water discharge shall warrant a review of Project Plans and possible recommendations for adjustment of management to address the specific problems.

Aquatic groups to be inventoried and monitored will include:

**-Benthic macroinvertebrates -** Determine population diversity using Hess/kick net sampling protocol to measure species abundance and establish a diversity index.
**-Amphibians and aquatic reptiles -** Determine population diversity and abundance utilizing sampling methodologies being developed for prairie species.
**-Non-game fish -** Determine population diversity using electrofishing and seining.
**-Algae (periphyton)** – Determine population diversity.

## PROTECTION MEASURES

Wildlife protection measures have been put in place through lease stipulations or terms and conditions from a Biological Opinion from FWS. The following sections describe stipulations or mitigation that restrict activities through lease agreements or terms and conditions to reduce the likelihood of "take" of a federally listed species.

### Lease stipulation

The lease stipulations were approved in the 1994 BLM Oil and Gas EIS. These are mandatory measures or actions that have been developed as a result of wildlife research and input from agencies and Operators. Avoidance of important breeding, nesting, and seasonal habitats is the primary protection measure that will reduce the possibility of CBM and Oil and Gas development having an impact on wildlife populations, productivity, or habitat use. Additional conservation measures will be incorporated through the Project Plan design or as Conditions of Approval. Data collected during monitoring efforts and properly analyzed will be used to determine the appropriateness and the effectiveness of these measures throughout the CBM project area. Based on the results of the monitoring data, these measures will be reviewed by the *Core Team* and *RMU Teams*. As monitoring data are collected over time, it is likely that some protection measures will be added, while others will be modified or removed completely with approval from the BLM in cooperation with other agencies and the *Core Team*. All changes in these protection measures will be reported, with a justification for the change, in annual reports. A RMP amendment may be required depending on the recommended change.

**"Waivers"** A lease stipulation may be waived by the Authorized Officer (AO) if a determination is made by the BLM, in consultation with FWS, that the proposed action will not adversely affect the species in question.

**"Exceptions"** to protection measure may be granted by the AO, in coordination with USFWS for T&E species and MFWP, if the Operator submits a plan that demonstrates that impacts from the proposed action will not be significant, or can be adequately mitigated.

**"Modifications"** may be made by the AO if it is determined that portions of the area do not include habitat protected by the stipulation.

### Raptors

From March 1 – August 1, all surface disturbing activities are prohibited within ½ mile of active raptor nest sites except ferruginous hawk, bald eagle and peregrine falcon nest sites. For ferruginous hawks and bald eagles, no surface occupancy or use will be allowed within ½ mile of known active nest sites. No surface occupancy or use is allowed within 1 mile of identified peregrine falcon nests. Active raptor nests are defined as those that have been used within the last two years.

### Big Game

Surface use is prohibited to avoid disturbance of white-tailed deer, mule deer, elk, pronghorn antelope, moose, and bighorn sheep during the winter use season, December 1 - March 31. This stipulation does not apply to the operation and maintenance of production facilities.

## Elk Parturition Range

In order to protect elk parturition range, surface use is prohibited from April 1 to June 15 within established spring calving range. This protection measure does not apply to the operation and maintenance of production facilities.

## Bighorn Sheep – Powder River Breaks

No surface occupancy or use is allowed in the designated Powder River Bighorn Sheep Range. In crucial winter range outside of the designated area, surface use is prohibited from December 1 to March 31.

## Sage Grouse

*Lek sites*
In order to minimize impacts to sharptail and sage grouse leks, surface occupancy within ¼ mile of known leks is prohibited. The measure may be waived if the AO, in coordination with MFWP, determines that the entire leasehold can be occupied without adversely affecting grouse lek sites, or if all lek sites within ¼ mile of the leasehold have not been attended for 5 consecutive years.

*Nesting area*
Surface use is prohibited between March 1 – June 15 in grouse nesting habitat within 2 miles of a known lek. This measure does not apply to the operation and maintenance of production facilities. This measure will be implemented to protect sharptail and sage grouse nesting habitat from disturbance during spring and early summer in order to maximize annual production of young, and to minimize disturbance to nesting activities adjacent to nesting sites for the long-term maintenance of grouse populations in the area.

*Winter range*

Surface use is prohibited from December 1 through March 31 within designated crucial winter range to protect sage grouse from disturbance during winter season use.

## Prairie Dog Towns and Associated Black-footed Ferret Habitat

Prior to surface-disturbing activities, prairie dog colonies and complexes 80 acres or more in size and containing 5 burrows per acre will be examined to determine the presence or absence of black-footed ferrets. The findings of this examination may result in some restrictions to the operator's plans or may even preclude use and occupancy.

The lessee or operator may, at their own option, conduct an examination on the leased lands to determine if black-footed ferrets are present, or if the proposed activity would have an adverse effect, or if the area can be cleared. This examination must be done by, or under the supervision of, a qualified resource specialist approved by the BLM. An acceptable report must be provided to documenting the presence or absence of black-footed ferrets and identifying the anticipated effects of the proposed action on the black-footed ferret and its habitat. This stipulation does not apply to the operation and maintenance of production facilities.

## Interior Least Tern

The interior least tern is listed as an endangered species under the ESA. Birds occupy sandbars and beaches in eastern Montana and along the Yellowstone and Missouri Rivers. Surface occupancy and will be prohibited within 1/4 mile of wetlands identified as interior least tern habitat.

## Terms and Conditions from Section 7 Consultation

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions, which implement the reasonable and prudent measures described and outlined in the Biological Opinion. **These terms and conditions are nondiscretionary.**

## All Species

In the event that a bald eagle (dead or injured) or mountain plover (dead or injured) is located during construction and operation, the Service's Billings Sub-Office of the Montana Field Office (406-247-7366) and the Service's Law Enforcement Office (406-247-7355) will be notified within 24 hours. The action agency must provide for monitoring the actual number of individuals taken. Because of difficulty in identification, all small birds found dead should be stored in a freezer for the Service to identify.

- The Bureau shall monitor all loss of bald eagle (nesting, potential nesting and roost sites) and suitable mountain plover habitat associated with all actions covered under the *Montana Statewide Draft Oil and Gas EIS and Amendment of the Powder River and Billings RMPs* and ROD. Bald eagle nesting, potential nesting and roost sites, and suitable mountain plover habitat have been defined under 'habitat use' and 'critical habitat' respectively, for each species in the Biological Opinion. The actual measurement of disturbed habitat can be the responsibility of the BLM their agent (consultant, contractor, etc) with a written summary provided to the Service's Montana Field Office upon project completion. The tracking will include the location and acres of habitat loss, field survey reports, what stipulations were applied, and a record of any variance granted to timing and/or spatial buffers. The monitoring of habitat loss for these species will commence from the date the Record of Decision (ROD) is signed. The actual measurement of disturbed habitat can be the responsibility of the Bureau's agent (consultant, contractor, etc.) with a written summary provided to the Service's Montana Field Office semi-annually, or immediately if the Bureau determines that action (*i. e.* Application for Permit to Drill (APD), pipeline, compressor station) will adversely affect a listed species. However, it is the responsibility of the Bureau to ensure that the semi-annual reports are complete and filed with the Service in a timely manner. The semi-annual report will include field survey reports for endangered, threatened, proposed and candidate species for all actions covered under the *Montana Statewide Draft Oil and Gas EIS and Amendment of the Powder River and Billings RMPs* and ROD. The semi-annual reports will include all actions completed under this BO up to 30 days prior to the reporting date. The first report will be due 6 months from the signing of the ROD and on the anniversary date of the signing of the ROD. Reporting will continue for the life of the project.

- As outlined in the guidance and conservation measures in the *CBM Programmatic Wildlife Monitoring and Protection Plan for the Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans* that "All new roads required for the proposed project will be appropriately constructed, improved, maintained, and signed to minimize potential wildlife/vehicle collisions... Appropriate speed limits will be adhered to on all project area roads, and Operators will advise employees and contractors regarding these speed limits."

## Bald Eagle

- The Bureau shall require implementation of all conservation measures/mitigation measures identified in the Biological Assessment prepared for the project and dated April 10, 2002, and wildlife inventory, monitoring, and protection protocol provided by the WMPP. The Bureau shall monitor for compliance with the measures and protocol. These are as follows:

- The appropriate standard seasonal or year-long stipulations for raptors or no surface occupancy for bald eagles as identified in the Billings Resource Management Plan (U.S. Bureau of Land Management 1983), Powder River Resource Management Plan (BLM 1984), and Oil and Gas Resource Management Plan/ EIS Amendment (BLM 1992) will be applied. This includes No Surface Occupancy within ½ mile of nests active in the last 7 years and ½ mile of roost sites.

- Inventory and monitoring protocol for the bald eagle will be as described for raptors, with the following additions. Operators will indicate the presence of eagle habitat as previously defined, on their application. Prior to CBM development or construction, surveys of the wooded riparian corridors within 1.0 mile of a project area will be conducted in the winter and/or spring by biologists and/or BLM-approved biologists to determine the occurrence of winter bald eagle roosts. Surveys will be conducted from daybreak to 2 hours after sunrise and/or from 2 hours before sunset to 1 hour after sunset by fixed-wing aircraft. Follow-up ground surveys, if necessary, will be conducted during the same time frame. Surveys will be at least 7 days apart. The location, activity, number, and age class (immature, mature) of any bald eagles observed will be recorded and if a roost or suspected roost is identified, BLM, USFWS, and MFWP will be notified and a GPS record of the roost/suspected roost will be obtained and entered into the BLM GIS database. There will be No Surface Occupancy within 0.5 miles of any identified bald eagle roost sites.

- Nest productivity will be conducted by the BLM or a BLM approved biologist in areas with high levels of development (i.e., areas with greater than or equal to 4 well locations/section) on and within 1 mile of the project area. Active nests located within one mile of project-related disturbance areas will be monitored between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings per nest).

- No new above-ground power line should be constructed within the Primary Use Area or ½ mile from an active eagle nest or nest that has been occupied within the recent past. No surface occupancy or use is allowed within 0.5 miles of known bald eagle nest sites which have been active within the past 7 years. All other actions will be consistent with the *Montana Bald Eagle Management Plan - July 1994*.

- Power lines will be built to standards identified by the Avian Power Line Interaction Committee (1996) to minimize electrocution potential. The Service has more specific recommendations that reaffirm and compliment those presented in *Suggested Practices*. It should be noted that these measures vary in their effectiveness to minimize mortality, and may be modified as they are tested in the field and laboratory. Local habitat conditions should be considered in their use. The Service does not endorse any specific product that can be used to prevent and/or minimize mortality, however, we are providing a list of *Major Manufacturers of Products to Reduce Animal Interactions on Electrical Utility Facilities.*

## New Distribution Lines and Facilities

The following represents areas where the raptor protection measures will be applied when designing new distribution line construction:

1.1 Bury distribution lines where feasible.

1.2 Raptor-safe structures (e.g., with increased conductor-conductor spacing) are to be used that address adequate spacing for each problematic species (i.e., minimum 60" for bald eagles would cover all species).

1.3 Equipment installations (overhead service transformers, capacitors, reclosers, etc.) are to be made raptor safe (e.g., by insulating the bushing conductor terminations and by using covered jumper conductors).

1.4 Jumper conductor installations (e.g., corner, tap structures, etc) are to be made raptor safe by using covered jumpers or providing adequate separation.

1.5 Employ covers for arrestors and cutouts.

1.6 Lines should avoid high avian use areas such as wetlands, prairie dog towns, and grouse leks. If not avoidable, use anti-perching devices to discourage perching in sensitive habitats such as grouse leks, prairie dog towns and wetlands to decrease predation and decrease loss of avian predators to electrocution.

## Modification of Existing Facilities

Raptor protection measures to be applied when retrofitting existing distribution lines. Problem structures may include dead ends, tap or junction poles, transformers, reclosers and capacitor banks or other structures with less than 60" between conductors or a conductor and ground. The following modifications will be made:

2.1 Cover exposed jumpers.

2.3 Gap any pole top ground wires.

2.4 Isolate grounded guy wires by installing insulating link.

2.5 On transformers, install insulated bushing covers, covered jumpers, cutout covers and arrestor covers.

2.6 When mortalities occur on existing lines and structures, raptor protection measures are to be applied (e.g., modify for raptor-safe construction, install perches, perching deterrents, nesting platforms, nest deterrent devices, etc).

2.7 Use anti-perching devices to discourage perching in sensitive habitats such as grouse leks, prairie dog towns and wetlands to decrease predation, and decrease loss of avian predators to electrocution.

2.8 In areas where midspan collisions are a problem, install line-marking devices that have been proven effective. All transmission lines that span streams and rivers, should maintain proper spacing and have markers installed.

These additional standards to minimize migratory bird mortalities associated with utility transmission lines, will be incorporated into the Terms and Conditions for all APD's and stipulations for Right-Of-Way applications.

## Mountain Plover

- The Bureau shall require implementation of the conservation measures for mountain plover as identified in the Biological Assessment prepared for the project and dated April 10, 2002, and wildlife inventory, monitoring, and protection protocol provided by the *WMPP*. The Bureau shall monitor for compliance with the measures and protocol. These are as follows:

- Surface use is prohibited within 1/4 mile of active mountain plover nest sites. Disturbance to prairie dog towns will be avoided where possible. Any active prairie dog town occupied by mountain plover will have No Surface Use between April 1 and July 31. This area may be reduced to No Surface Use within 1/4 mile of an active nest, once nesting has been confirmed. An exception may be granted by the authorized officer after the BLM consults with the FWS on a case by case basis and the operator agrees to adhere to the new operational constraints.

- Due to the declining status of mountain plover in the analysis area and the need to retain this most important and limited nesting habitat, all active prairie dog colonies within suitable mountain plover habitat will have No Surface Occupancy (NSO). This NSO will be applied only to federally managed surface acres. This NSO may be modified in an amendment to this biological opinion after analysis of impacts to this preferred nesting habitat is completed.

- The BLM will determine the acreage of occupied black-tailed prairie dog habitat within the suitable mountain plover habitat of federally managed surface acres and on federal mineral estate lands. Further, a reasonable effort should be made to estimate the actual impacts, including habitat loss, CBM development will have on occupied black-tailed prairie dog acres within suitable mountain plover habitat over the entire project area. The project area is large and certain areas will likely be developed for coal bed methane before others. The BLM, Service, and cooperators will develop a survey protocol that may include prioritization of subsets of the project area to be analyzed. Based on the results of such analysis, the NSO on active prairie dog within suitable mountain plover habitat may be modified in an amendment to the biological opinion.

- Prior to permit approval, habitat suitability will be determined. The BLM, FWS and MFWP will estimate potential mountain plover habitat across the CBM area using a predictive habitat model. Over the next 5 years, information will be refined by field validation using most current Service mountain plover survey guidelines (USFWS 2002c) to determine the presence/absence of potentially suitable mountain plover habitat. In areas of suitable mountain plover habitat, surveys will be conducted prior to ground disturbance activities by the BLM or a BLM-approved Operator biologist using the Service protocol at a specific project area plus a 0.5 mile buffer. Efforts will be made to identify mountain plover nesting areas that are not subject to CBM development to be used as reference sites. Comparisons will be made of the trends in mountain plover nesting occupancy between these reference areas and areas experiencing CBM development.

- The BLM shall monitor all loss of mountain plover habitat associated with all portions of this action (operators will indicate the presence of prairie dog towns or other mountain plover habitat indicators on their application) . Suitable mountain plover habitat has been defined under ‘critical habitat’ for the mountain plover in the Biological Opinion. The actual measurement of disturbed habitat can be the responsibility of the BLM, their agent (consultant, contractor, etc) with a written summary provided to the Service’s Montana Field Office upon project completion, or immediately if the anticipated impact area is exceeded.

- If suitable mountain plover habitat is present, surveys for nesting mountain plovers will be conducted prior to ground disturbance activities, if ground disturbing activities are anticipated to occur between April 10 and July 10. Disturbance occurring outside this period is permitted, but any loss of mountain plover suitable habitat must be documented. Sites must be surveyed 3 times between the April 10 and July 10 period, with each survey separated by at least 14 days. The earlier date will facilitate detection of early-breeding plovers. A disturbance-free buffer zone of 1/4 mile will be established around all mountain plover nesting locations between April 1 and July 31. If an active nest is found in the survey area, the planned activity should be delayed 37 days, or seven days post-hatching. If a brood of flightless chicks is observed, activities should be delayed at least seven days (USFWS 2002). Exceptions and/or waiver to stipulations can be made through consultation with FWS on a case by case basis.

- Roads will be located outside of nesting plover habitat wherever possible. Apply mitigation measures to reduce mountain plover mortality caused by increased vehicle traffic. Construct speed bumps, use signing or post speed limits as necessary to reduce vehicle speeds near mountain plover.

- Creation of hunting perches will be minimized within ½ mile of occupied nesting areas. Utilize perch inhibitors (perch guards) to deter predator use.

- Native seed mixes will be used to re-establish short grass prairie vegetation during reclamation.

- There will be No Surface Occupancy of ancillary facilities (e.g., compressor stations, processing plants) within ½ mile of known nesting areas. Variance may be granted after consultation with the Service.

- In habitat known to be occupied by mountain plover, no dogs will be permitted at work sites to reduce the potential for harassment of plovers.

- Operators and the Bureau shall be provided by the Service with educational material illustrating and describing the mountain plover, its habitat needs, life history, threats, and gas development activities that may lead to incidental take of eggs, chicks, or adults with requirements that these material be posted in common areas and circulated in a memorandum among all employees and service providers.

## Programmatic Guidance for the Development of Project Plans

Guidance for developing Project Plans and/or conservation measures applied as Conditions of Approval provide a full range of practicable means to avoid or minimize harm to wildlife species or their habitats. Operators will minimize impacts to wildlife by incorporating applicable WMPP programmatic guidance into Project Plans. Not all measures may apply to each site-specific development area and means to reduce harm are not limited to those identified in the WMPP. This guidance may change over time if new Conservation Strategies become available for Special Status Species or monitoring indicates the measure is not effective or unnecessary.

BLM and MFWP will work together through a Cooperative Agreement to collect baseline information about wildlife and sensitive habitats possibly containing special status species. During the project development phase, Operators will identify potentially sensitive habitats and coordinate with BLM to determine which species or habitats are of concern within or adjacent to the project area. In areas where required site-specific wildlife inventory has not been completed, Operators and BLM will work cooperatively to achieve it. BLM's responsibilities under NEPA, ESA, and NHPA essentially are the same on split estate (i.e., federal minerals/private surface) as they are with federal surface. BLM and Operators will seek input from the private surface owner to include conservation measures in split estate situations.

The following guidance and conservation measures are considered "features" or project "design criteria" to be used during Project Plan preparation. The design of projects can incorporate conservation needs for wildlife species or measures can be added as "Conditions of Approval." These types of conservation actions offer flexibility for local situations and help minimize or eliminate impacts to the species of interest.

1. Use the best available information for siting structures (e.g., storage facilities, generators and holding tanks) outside of the applicable zone of impact in important wildlife breeding, brood-rearing and winter habitat based on the following considerations.
    a. size of the structure(s),
    b. level/type of anticipated disturbance
    c. life of the operation, and
    d. extent to which impacts would be minimized by topography.

2. Concentrate energy-related facilities when practicable.

3. Develop a comprehensive Project Plan prior to POD or full field development activities to minimize road densities.

4. To reduce additional surface disturbance, existing roads and two-tracks on and adjacent to the CBM project area will be used to the extent possible and will be upgraded as necessary.

5. Minimize stream channel disturbances and related sediment problems during construction of road and installation of stream crossing structures. Do not place erodible material into stream channels. Remove stockpiled material from high water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.

6. Design stream-crossings for adequate passage of fish (if present), minimum impact on water quality, and at a minimum, the 25-year frequency runoff. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill.

7. Use corridors to the maximum extent possible: roads, power, gas and water lines should use the same corridor whenever possible.

8. Avoid, where possible, locating roads in crucial sage grouse breeding, nesting and wintering areas and mountain plover habitats. Develop a route utilizing topography, vegetative cover, site distance, etc. to effectively protect identified wildlife habitats in a cost efficient manner.

9. Conduct all road and stream crossing construction and maintenance activities in accordance with Agency approved mitigation measures and BMPs.

10. Utilize remote monitoring technologies whenever possible to reduce site visits thereby reducing wildlife disturbance and mortalities.

11. All new roads required for the proposed project will be appropriately constructed, improved, maintained, and signed to minimize potential wildlife/vehicle collisions and facilitate wildlife movement through the project area. Appropriate speed limits will be adhered to on all project area roads, and Operators will advise employees and contractors regarding these speed limits.

12. Apply mitigation measures to reduce mountain plover, swift fox or sage grouse mortality caused by increased vehicle traffic. Construct speed bumps, use signing or post speed limits as necessary to reduce vehicle speeds near sage grouse leks, mountain plover habitat, or other important wildlife habitats

13. Road closures may be implemented during crucial periods (e.g., extreme winter conditions, and calving/fawning seasons). Personnel will be advised to minimize stopping and exiting their vehicles in big game winter range while there is snow on the ground.

14. Roads no longer required for operations or other uses will be reclaimed if required by the surface owner or surface management agency. Reclamation will be conducted as soon as practical.

15. Operator personnel and contractors will use existing state and county roads and approved access routes, unless an exception is authorized by the surface management agency.

16. Use minimal surface disturbance to install roads and pipelines and reclaim sites of abandoned wells to restore natural plant communities.

17. Reclamation of disturbed areas will be initiated as soon as practical. Native species will be used in the reclamation of important wildlife habitat. Livestock palatability and wildlife habitat needs will be considered during seed mix formulation.

18. Site new power lines and pipelines in existing disturbed areas wherever possible.

19. Minimize the number of new power lines in sage grouse or mountain plover habitat. Bury lines near sage grouse leks and mountain plover nesting habitat when feasible.

20. Encourage monitoring of avian mortalities by entering into a Memorandum of Understanding (MOU) with FWS and the state agencies. The purpose of the MOU is to establish procedures and policies to be employed by the parties to lessen industry's liability concerns about the "take" of migratory birds.

21. Remove unneeded structures and associated infrastructure when project is completed.

22. If possible, minimize maintenance and related activities in sage grouse breeding/nesting complexes; 15 March -15 June, between the hours of 4:00-8:00 am and 7:00-10:00 pm.

23. Protect, to the extent possible, natural springs from disturbance or degradation.

24. Design and manage produced water storage impoundments so as not to degrade or inundate sage grouse leks, nesting sites and wintering sites, prairie dog towns or other Special Status Species habitats.

25. CBM produced water should not be stored in shallow, closed impoundments or playas. Impoundments designed as flow through systems will lessen the likelihood that selenium will bioaccumulate to levels that will adversely affect other wildlife.

26. Develop offsite mitigation strategies in situations where fragmentation or degradation of Special Status Species habitat is unavoidable.

27. Protected reserve, workover, and production pits potentially hazardous to wildlife by netting and/or fencing as directed by the BLM to prevent wildlife access and minimize the potential for migratory bird mortality.

28. Reduce potential increases in poaching through employee and contractor education regarding wildlife laws. Operator should report violations to BLM and MFWP.

29. Operator employees and their contractors will be discouraged from possessing firearms during working hours.

**Table 1.** Summary of General Wildlife Reporting, Inventory, and Monitoring, CBM Development; Powder River and Billings Resource Management Plans, CBM Amendment (2002)

| Action | Dates | Responsible Entity[a] |
|---|---|---|
| Plans of development for outcoming years, showing general location of proposed development | Annually | Team (BLM, USFWS, MFWP, Operators) |
| Annual reports summarizing findings and presenting necessary protection actions | Annually | BLM with reviews MFWP, USFWS, Operators, and other interested parties |
| Meeting to finalize future year's inventory, monitoring, and protection measures | Annually | BLM with participation by USFWS, MFWP, Operators, and other interested parties |
| Inventory and Monitoring | | |
| Big game crucial winter range use monitoring (crucial winter range on the RMU plus 1-mile buffer) | When Applicable | MFWP with BLM assistance |
| Determine mountain plover habitat suitability | Prior to permit approval | BLM & operator assistance |
| In areas of suitable mountain plover habitat, conduct nest surveys in project area plus a .5 mile buffer | Prior to ground disturbing activities | BLM & operator assistance |
| In areas of suitable mountain plover habitat, map active black-tailed prairie dog colonies on federal surface and federal mineral estate. | Over the next couple years to provide data for an analysis required in the biological opinion. | BLM & operator assistance |
| Active prairie dog colonies within .5 mile of a specific project area will be identified, mapped and surveyed | Prior to permit approval | BLM with MFWP & operator assistance |
| Raptor nest inventories (RMU plus 1 mile buffer; burrowing owls excluded) | Every 5 years during April and May | BLM with MFWP & operator assistance |

Continuation of **Table 1.** Summary of General Wildlife Reporting, Inventory, and Monitoring, CBM Development; Powder River and Billings Resource Management Plans, CBM Amendment (2002)

| | | |
|---|---|---|
| In areas with potential bald eagle winter roost sites, conduct surveys within 1 mile buffer | Prior to ground disturbing activities | BLM & operator assistance |
| Conduct bald eagle nest inventories within .5 miles buffer of project area | Between March 1 and mid July | BLM & operator assistance |
| Monitor productivity at active bald eagle nests within 1 mile of project-related disturbance | Between March 1 and mid July | BLM & operator assistance |
| Raptor nest productivity monitoring at active nests within 1 mile of project disturbance area | Every 5 years during March to mid-July | BLM with MFWP & operator assistance |
| Aerial sage grouse lek inventories (RMU plus 2 mile buffer) | Every 5 years | BLM with MFWP & operator assistance |
| Sage grouse lek attendance monitoring on and within 2 miles of the RMU | Annually | BLM with MFWP & operator assistance will visit selected leks each year so that all leks will be visited at least once over a 3 year period |
| Threatened, Endangered & Sensitive species inventory/monitoring within selected CBM development areas and selected undeveloped comparison areas | When Applicable | BLM with MFWP & operator assistance |
| Native American culturally significant species | When Applicable | BLM, MFWP, Tribal Representatives & Operator Assistance |
| Other wildlife species inventory/monitoring within selected CBM development areas and selected undeveloped comparison areas | When Applicable | BLM with MFWP & operator assistance |

**Table 2.** Summary of APD/ROW Survey and Protection Measures, CBM Development within the Powder River and Billings Resource Management Plans

| Protection Measure | Dates |
|---|---|
| Bald eagle nest surveys within 0.5 mile of project area | Yearlong |
| Bald eagle nest avoidance within 0.5 mile of active nests | No Surface Use or Occupancy |
| Bald Eagle Winter Roost surveys within 1 mile of project area | December 1 to April 1 |
| Bald Eagle Winter Roost avoidance within 0.5 miles of roost site | No surface Use or Occupancy |
| Black-footed ferret surveys | Prairie dog colonies > 80 acres |
| Mountain plover surveys within 0.5 miles of project area | May 1 to June 15 |
| Active prairie dog colonies on federal surface in mountain plover habitat | BLM & operator assistance |
| Mountain plover nest/brood avoidance within .25 miles of project area | April 1 to July 31 |
| Peregrine falcon nest avoidance within 1 mile of active nest | BLM & operator assistance |
| Ferruginous nest avoidance within .5 miles of an active nest | No surface use or occupancy |
| Threatened, Endangered &Sensitive species surveys | As necessary |
| Threatened, Endangered &Sensitive species avoidance | As necessary |
| Big game crucial winter range avoidance | December 1 - March 31 |
| Elk Parturition Range avoidance | April 1 - June 15 |
| Big Horn Sheep – Powder River Breaks | No surface use or occupancy |

Continuation of **Table 2.** Summary of APD/ROW Survey and Protection Measures, CBM Development within the Powder River and Billings Resource Management Plans

| Protection Measure | Dates |
|---|---|
| Prairie dog colony mapping and burrow density determinations | Yearlong |
| Raptor nest survey/inventory within 0.5 miles of project area | Yearlong |
| Raptor nest avoidance within 0.5 miles of active nests | March 1 – August 1 |
| Sage grouse nesting habitat avoidance on areas within 2.0 miles of a lek | March 1 - June 15 |
| Sage grouse and sharptail lek avoidance within 0.25 miles of a lek | No Surface Use or Occupancy |
| Sharp-tailed grouse nesting habitat avoidance on areas within 0.5 mi. of a lek | March 1 – June 15 |
| Western burrowing owl surveys (prairie dog colonies within 0.5 miles of disturbance) | June – August |
| General wildlife avoidance/protection | As necessary |

**Table 3.** Additional Wildlife Inventory and Monitoring Measures On and Adjacent to Areas with High Levels of Development (4 Locations/Section), Powder River and Billings Resource Management Plans, CBM Amendment (2001)

| Action | Dates | Responsible Entity[b] |
|---|---|---|
| Raptor nest inventory/monitoring on areas with >.4 locations/section plus a 1-mile buffer and selected undeveloped comparison areas | Annually during April and May | BLM surveyor with Operator-provided financial assistance |
| Raptor productivity monitoring on areas with >.4 locations/section plus a 1-mile buffer and selected undeveloped comparison areas | Annually during March-July | BLM surveyor with Operator-provided financial assistance for BLM volunteer support |

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Continuation of **Table 3.** Additional Wildlife Inventory and Monitoring Measures On and Adjacent to Areas with High Levels of Development (4 Locations/Section), Powder River and Billings Resource Management Plans, CBM Amendment (2001)

| Action | Dates | Responsible Entity[b] |
|---|---|---|
| Selected TEC&SC inventory/monitoring on suitable habitats in areas with ≥ 4 locations/section plus a 1-mile buffer and selected undeveloped comparison areas | Annually during spring and summer | BLM or Operator-financed BLM-approved biologist |
| Collect baseline information for benthic macroinvertebrates, amphibians and aquatic reptiles, algae and non-game fish. Monitor changes on selected streams | Baseline 1 – 2 years prior and annually over the life of the project | BLM surveyor with Operator-provided financial assistance |
| Aerial sage grouse lek inventory on areas with 4 locations/section plus a 2-mile buffer and selected undeveloped comparison areas | Annually during March to mid-May | BLM surveyor with Operator-provided financial assistance |

Continuation of **Table 3.** Additional Wildlife Inventory and Monitoring Measures On and Adjacent to Areas with High Levels of Development (4 Locations/Section), Powder River and Billings Resource Management Plans, CBM Amendment (2001)

| Action | Dates | Responsible Entity[b] |
|---|---|---|
| Sage grouse lek attendance monitoring on areas with 4 locations/section plus a 2-mile buffer and selected undeveloped comparison areas | Year-long and in any year as deemed necessary by BLM and/or USFWS | Each known lek will be visited at least once annually by the BLM and/or an Operator-financed BLM-approved biologist; subsequent visits will occur at BLM-selected leks by the BLM, and/or Operator-financed BLM-approved biologist |
| Others studies on areas with 4 locations/section and selected undeveloped comparison areas | | USFWS and/or BLM with Operator- and other party-provided financial assistance |

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# BIOLOGICAL ASSESSMENT FOR
# COAL BED METHANE PRODUCTION
# IN MONTANA

*Prepared for*

U. S. FISH AND WILDLIFE SERVICE

APRIL 10, 2002

BY

BUREAU OF LAND MANAGEMENT (BLM),
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# BIOLOGICAL ASSESSMENT FOR COAL BED METHANE PRODUCTION IN MONTANA

## 1.0 INTRODUCTION

The Bureau of Land Management (BLM), Miles City and Billings District Offices, Montana, are proposing changes in the coal bed methane (CBM) development program. The Powder River and Billings RMPs, as amended by BLM's 1994 *Oil and Gas Amendment of the Billings, Powder River, and South Dakota Resource Management Plans* (RMPs), support conventional oil and gas development and limited CBM exploration and development. The BLM proposes to amend the Billings and Powder River RMPs to address increased interest in CBM in these districts. An Environmental Impact Statement (EIS) is being prepared to evaluate impacts arising from implementation of the amended RMPs. The State of Montana (state) has joined with the BLM as a co-lead agency in preparation of the EIS to address similar increased interest in CBM on state lands, emphasizing Park, Blaine, and Gallatin Counties. The state has placed a moratorium on state-permitted coal bed methane wells in Montana until an EIS is completed that addresses increased CBM activity.

The oil and gas industry predicts growing interest in the exploration and development of CBM because of efforts to find alternative energy sources. Increased CBM development would result in a major federal action with potential to significantly affect the environment. This Biological Assessment (BA) was compiled to consider the potential impacts on federally listed and proposed threatened and endangered (T&E) species from proposed changes to levels of CBM exploration and development in Montana. The BLM and the State are co-lead agencies for this BA. Designated cooperators-those who have signed a memorandum of understanding with the state-are the Environmental Protection Agency (EPA), Department of Energy (DOE), Bureau of Indian Affairs (BIA), and Crow Tribe of Montana.

This BA is being prepared pursuant to Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. The U.S. Fish and Wildlife Service (FWS), as required under the ESA, provided a list of federal endangered, threatened, and proposed threatened and endangered species that may be present in the project area (Table 1 and Appendix A). Nine federally listed threatened, endangered, and proposed for listing species potentially occur in the project area. Under the ESA, the BLM must ensure that activities instigated under this action do not jeopardize the continued existence of any threatened, endangered, or proposed for listing species. The FWS must concur that BLMs' actions will not jeopardize a listed species. Three candidate species may also potentially be found in the project area. Although not subject to the extensive procedural provisions of the ESA, the FWS encourages that no action be taken that could impact candidate species and contribute to the need to list the species. Three additional species for which the FWS has significant concern are sicklefin chub (*Hybopsis meeki*), sturgeon chub (*Hybopsis gelida*), and sage grouse (*Centrocercus europhasia*). These three species are listed because the FWS mentioned them specifically, but they have no federal status under Section 7 of the ESA. Avoidance of impacts to these species is recommended to avoid the need for future listing, but is not mandated by federal statute at this time. Impacts on these species will not be considered in this BA because they are considered in detail in the associated EIS.

Project Plans will be developed and approved using the programmatic guidance outlined in the Wildlife Monitoring Protection Plan (Biological Appendix of Draft EIS). They will include baseline inventory in areas where wildlife inventory has not been completed. Operators will be required to submit plans, which demonstrate how their project design minimizes or mitigates impacts to surface resources and meets objectives for wildlife. The Wildlife Monitoring Protection Plan is a cooperative approach, which incorporates adaptive environmental management principles and establishes a framework, which encourages industry, landowners and agencies to work together constructively to incorporate conservation measures into CBM development. All CBM development will follow the programmatic guidance to address wildlife concerns, and each individual Project Plan will include a site specific Monitoring and Protection Plan which includes mitigation specific to species or local habitats. Over the life of the CBM project, Wildlife Monitoring Protections Plans offer some assurances that management will be adapted to address specific situations.

TABLE 1
FEDERALLY-LISTED THREATENED, ENDANGERED, AND PROPOSED FOR LISTING SPECIES

| Common Name | Scientific Name | Habitat in Montana | Federal Status |
|---|---|---|---|
| **Listed Species** | | | |
| Mountain plover | *Charadrius montanus* | Arid, shortgrass prairieland in eastern Montana. | PT |
| Bald eagle | *Haliaeetus leucocephalus* | Forested riparian areas throughout the state | T |
| Interior least tern | *Sterna antillarum athalassos* | Sandbars and beaches in eastern Montana and along the Yellowstone and Missouri Rivers. | E |
| Gray wolf | *Canis lupus* | Adapted to many habitats, need large ungulate prey base and freedom from human influence. | E/10( j ) |
| Canada lynx | *Felis lynx canadensis* | Montane spruce/fir forest in western Montana. | T |
| Black-footed ferret | *Mustela nigripes* | Prairie dog complexes in Eastern Montana | E |
| Grizzly bear | *Ursus arctos horribilis* | Alpine/subalpine coniferous forest in Western Montana. | T |
| Pallid sturgeon | *Scaphirhynchus albus* | Bottom dwelling fish of the Missouri and Yellowstone Rivers | E |
| Ute ladies'-tresses | *Spiranthes diluvialis* | River meander wetlands in Jefferson, Madison, Beaverhead, and Gallatin Counties | T |
| **Candidate Species** | | | |
| Black-tailed prairie dog | *Cynomys ludovicianus* | Short-grass and mixed-grass prairie in the east of the 110th meridian, concentrated in Philips County, Custer County, Blaine County, Fort Belknap Reservation, and Crow Reservation. | C |
| Montana Arctic grayling | *Thymallus arcticus* | Fluvial populations in the cold-water, mountain reaches of the Upper Missouri River. | C |
| Warm spring zaitzevian riffle beetle | *Zaitzevia thermae* | Warm springs in Gallatin County. | C |
| **USFWS Species of Significant Concern** | | | |
| Sicklefin chub | *Hybopsis meeki* | Large free-flowing segments of the Missouri and Yellowstone Rivers. | NS |
| Sturgeon chub | *Hybopsis gelida* | The Powder and Lower Yellowstone rivers. | NS |
| Sage grouse | *Centrocercus europhasia* | Dependent upon sagebrush habitat. | NS |

PT=proposed threatened; T=threatened; E=endangered; E/10(j)=experimental/endangered; C=candidate; NS=no status.

# 2.0 PROJECT DESCRIPTION

Three action alternatives plus a No Action Alternative were originally proposed for this project. The Preferred Alternative discussed in this BA was selected based on an analysis of impacts for all alternatives.

Exploration and development of CBM resources on BLM, state, or fee minerals are allowed subject to agency decisions, lease stipulations, permit requirements, and surface owner agreements. Under the Preferred Alternative, operators would be required to submit a Project Plan outlining the proposed development of an area when requesting CBM well densities greater than 1 well per 640 acres. The Project Plan would be developed in consultation with the affected surface owner(s) and other involved permitting agencies. All shallow coal seams would have vertical wells installed; for deeper coal seams, the operator would drill directionally or demonstrate in the project plan for agency consideration why directional drilling is not needed or feasible. Operators would develop single or multiple coal seams per their plans, however, there would be only one well bore per coal seam per designated spacing restriction. Operators would also be required to demonstrate in their project plan how impacts to surface resources, such as wildlife, would be minimized or mitigated.

Protection of hydrological resources was one of the most critical concerns addressed during the development of the EIS, receiving significant analysis with regards to various options for the management of water produced with CBM. In light of those analyses, the Preferred Alternative combines management options so that no degradation of water quality would be allowed in any watershed. The hierarchy for water management options requires beneficial use as the first priority, followed by the operator's choice as outlined in a Water Management Plan, which must be submitted as part of the federal Project Plan of Development. A Water Management Plan would be required for exploratory wells, and for each Project Plan. Management options available include injection, treatment, impoundment, discharge, or other operator-proposed methods, provided they are addressed in the Water Management Plan and approved by the appropriate agency. Impoundments proposed as part of the Water Management Plan would be designed and located to minimize or mitigate impacts to soil, water, vegetation, and channel stability. No discharge of produced water (treated or untreated) would be allowed into the watershed unless the operator has an approved NPDES permit and can demonstrate in the Water Management Plan how discharge could occur in accordance with water quality laws without damaging the watershed.

The air quality objectives for the proposed action include maximizing the number of wells connected to each compressor and requiring natural gas-fired engines for compressors and generators, except in areas with sensitive resources, including people, where noise is an issue. In those areas, the decibel level would be required to be no greater than 50 decibels measured at a distance of one-quarter mile from the compressor. This may require installation of an electrical booster at these locations.

Transportation corridors would not be required for utilities, roads, and pipelines. However, existing disturbances would be used where possible. The operator will also address in the Project Plan how the surface owner was consulted for input into the location of roads, pipeline and utility line routes. For powerlines, the operator will demonstrate in the Project Plan how the proposal for power distribution would mitigate or minimize impacts to affected wildlife. For example, the operator may propose that all or a portion of the powerlines be buried and any aboveground lines be designed following raptor-safe specifications. When wells are abandoned, the associated oil and gas roads would remain open or be closed at the surface owner's discretion. If the roads where requested to be closed they would be rehabilitated. This includes leaving BLM and state roads open, if access is desirable.

As with current management, there would be no buffer zone for CBM production around active coal mines (MSO IM No. 2000-053, June 1, 2000, *No Surface Occupancy Stipulations*).

To determine potential impacts to the Crow and Northern Cheyenne reservations, monitoring wells would be required to be installed during the exploration phase on all BLM-administered oil and gas estates that adjoin reservation boundaries in Montana. If monitoring indicates drawdown would occur on the reservation, mitigation such as the operator providing a hydrologic barrier, communitization agreement, or spacing that would protect the Indian minerals from drainage would be required. This BA addresses environmental impacts from implementation of the Preferred Alternative.

## 2.1 Project Location

The project is located across south-central and southwestern Montana with additional project areas in Gallatin and Park County in southwestern Montana and in Blaine County in north-central Montana. This area includes parts of sixteen counties: Blaine, Gallatin, Park, Carter, Powder River, Custer, Rosebud, Treasure, Wheatland, Sweet Grass, Stillwater, Carbon, Golden Valley, Musselshell, Yellowstone, and Big Horn.

Because of the extensive area covered, Map 1-1 is provided instead of legal descriptions.

The planning area shown in Map 1-1 is defined as the area where oil and gas decisions will be made by BLM or the State of Montana. The BLM's planning area is the oil and gas estate administered by the BLM in the Powder River and Billings RMP areas. The State of Montana's planning area is statewide, with emphasis on the state-administered oil and gas within the BLM planning area and in Blaine, Park and Gallatin counties. The planning area excludes those lands administered by the Forest Service, the Crow Tribe, Northern Cheyenne Tribe, and other Indian lands.

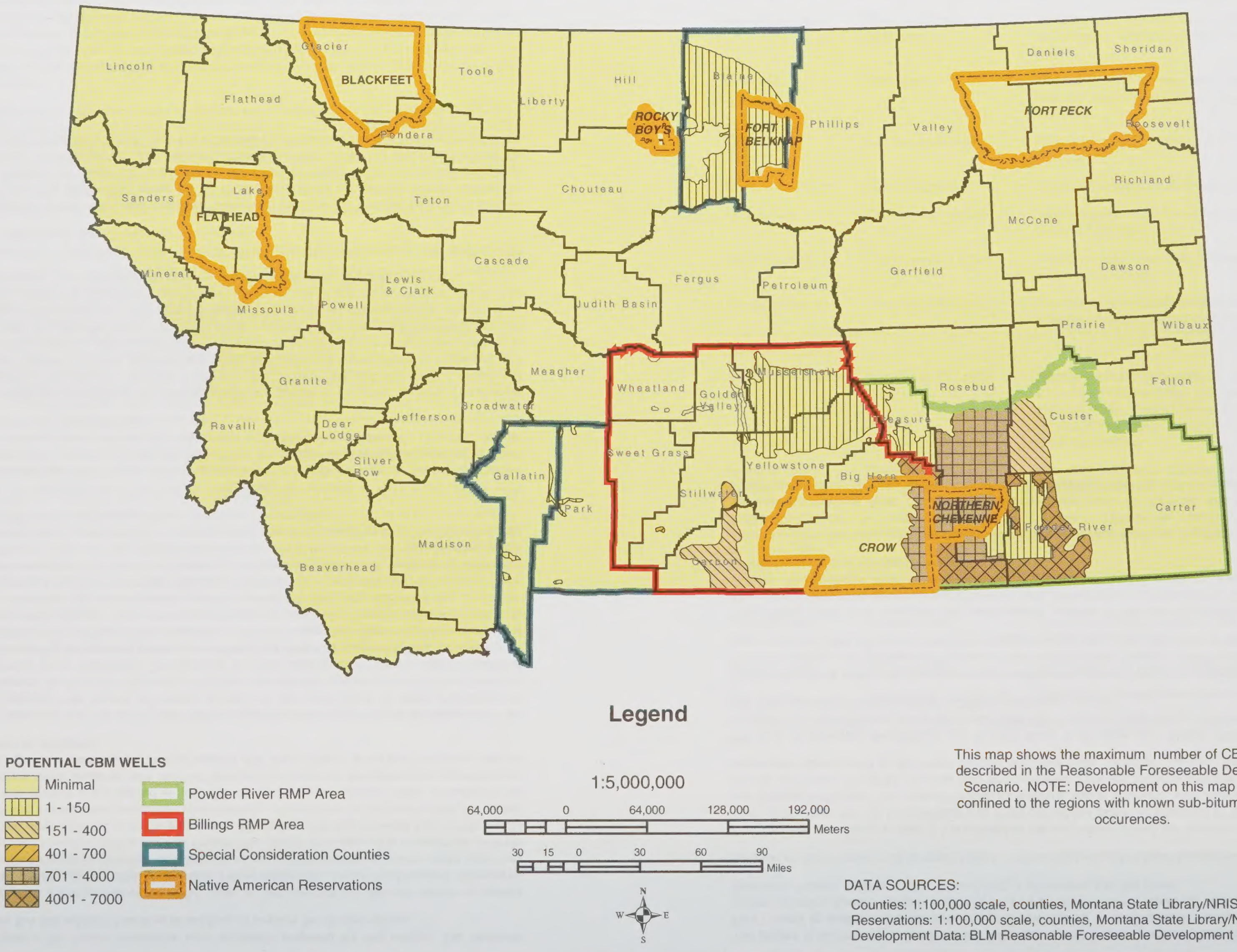
For ease of reference, the Billings and Powder River RMP areas, and Blaine, Park, and Gallatin counties, are referred to in the document as the BLM and State CBM emphasis area. This is the 16-county area within the BLM and state planning area where there is CBM development interest.

The Powder River RMP area encompasses the southeastern corner of Montana, including Powder River, Carter, and Treasure counties, and portions of Big Horn, Custer, and Rosebud counties. The Powder River RMP area comprises approximately 1,080,675 acres of federally managed surface and 4,103,700 acres of federal mineral estate.

The Billings RMP area comprises the south-central portion of Montana consisting of Carbon, Golden Valley, Musselshell, Stillwater, Sweet Grass, Wheatland, and Yellowstone counties and the remaining portion of Big Horn County. The Billings RMP area comprises approximately 425,336 acres of federally managed surface and 906,084 acres of federal mineral estate.

Adjacent to the planning areas, other major land holdings include the Crow, Northern Cheyenne, and Fort Belknap Indian Reservations, the Custer National Forest, portions of Yellowstone National Park, the Big Horn Canyon National Recreational Area, the Burlington Northern and Santa Fe Railroad, and the Fort Keogh Agricultural Experiment Station. The total surface area of the CBM emphasis area (all owners) exceeds 25 million acres.

## Map 1-1: CBM Development Based on Reasonable Foreseeable Development Scenario


Lincoln
Flathead
Glacier
BLACKFEET
Toole
Liberty
Hill
Blaine
ROCKY BOY'S
FORT BELKNAP
Phillips
Valley
Daniels
Sheridan
FORT PECK
Roosevelt
Pondera
Sanders
Lake
FLATHEAD
Teton
Chouteau
Richland
McCone
Mineral
Missoula
Powell
Lewis & Clark
Cascade
Fergus
Petroleum
Garfield
Dawson
Judith Basin
Prairie
Wibaux
Granite
Meagher
Wheatland
Golden Valley
Musselshell
Rosebud
Fallon
Ravalli
Deer Lodge
Jefferson
Broadwater
Treasure
Custer
Silver Bow
Gallatin
Sweet Grass
Yellowstone
Big Horn
Stillwater
NORTHERN CHEYENNE
Park
Carter
Madison
Powder River
CROW
Carbon
Beaverhead
Legend
POTENTIAL CBM WELLS
Minimal
1 - 150
151 - 400
401 - 700
701 - 4000
4001 - 7000
Powder River RMP Area
Billings RMP Area
Special Consideration Counties
Native American Reservations
1:5,000,000
64,000
0
64,000
128,000
192,000
Meters
30
15
0
30
60
90
Miles
N
W
E
S

This map shows the maximum number of CBM wells as described in the Reasonable Foreseeable Development Scenario. NOTE: Development on this map has been confined to the regions with known sub-bituminous coal occurences.

DATA SOURCES:

Counties: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana.
Reservations: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana.
Development Data: BLM Reasonable Foreseeable Development Scenario.

## 2.2 Purpose and Need

The purpose of the project is to provide direction and analysis for CBM exploration and development on the Powder River RMA, the Billings RMA, and state lands.

The oil and gas analysis in current BLM planning documents did not predict as many wells. A BA to establish the impacts to federally listed species is needed to analyze the effects from full-field oil and gas development.

## 2.3 Construction Techniques

Each well project has four phases: exploration, development, operation, and shutdown. Once a well is in place, it is expected to operate for 20 years before abandonment. The BA focuses on the first two phases, exploration and development. These lead to the operation phase, once the well is in place.

During exploration, 4.14 acres are likely to be disturbed for each well for exploration, construction, and drilling operations. Table 2 shows the land area that would be directly disturbed by CBM development and the expected length of road and utility corridors. When exploratory construction begins on a site, the exploratory well will take about 3 to 5 days to drill, with 2 to 3 extra days to complete for CBM if the site is developed. During the exploratory phase, wildlife species will be disturbed by the presence of bulldozers, drilling equipment, and other machinery. The short-term disturbance effect of the exploratory phase will end with either abandonment or continuation to the development stage, if the well site is suitable for production. If the site is abandoned after exploration, the site will take approximately 5 years to attain preconstruction vegetative canopy cover values. Reclamation of the site with vegetation will be undertaken, but restoration to pre-project conditions is not planned.

**TABLE 2**
**ESTIMATES OF LAND AREA THAT WILL BE DIRECTLY DISTURBED BY THE PREFERRED ALTERNATIVE**

| Area Disturbed per Well (acres) | Length of Road per Well (miles) | Length of Utility Corridor per Well (miles) | Total Number of Wells | Total Area Disturbed (acres) | Total Length CBM Roads (miles) | Total Length Utility Corridors |
|---|---|---|---|---|---|---|
| 4.14 | 0.365 | 1.13 | 18,300 | 75,762 | 9018 | 27,917 |

Development disturbance will begin if exploration results in estimates of suitable levels of production. This and operational disturbance should be considered long-term because of the permanent placement of the pad. The materials source for roads would be located as close as possible to each project site, but no specific sources have been identified at this time.

## 3.0 DATA COLLECTION AND ASSESSMENT

Appropriate federal and state agencies were contacted in order to obtain information on specific habitats and areas within the project area where listed species may potentially occur. Research literature was reviewed for listed species. Biologists with knowledge of the area were interviewed before assessing impacts that could result from project implementation. Impacts would be considered significant if implementation of the Preferred Alternative would adversely affect any listed or proposed species, including destruction of occupied habitat or "taking" (harm, harassment, pursuit, injury, or kill) of federally listed wildlife or plant species.

## 3.1 Literature Studies

A literature search was conducted to determine habitat requirements for each listed species. Habitat requirements for listed species were then compared to terrestrial vegetation communities in the project area to determine the potential for occurrence of listed species. If suitable habitat was present, a literature search was completed to determine if existing site-specific or regional data on the species were available. The broad geographic area covered by this BA means that every species listed has some potential habitat within the proposed project's boundary.

## 3.2 Survey Methodologies

No specific surveys were conducted for this BA. Therefore, it is essential that clearance surveys be conducted on a site-by-site basis before CBM exploration begins. Site clearances and field survey methodologies differ according to the species of interest.

### 3.2.2 MAMMALS

Five mammalian species of concern potentially occur in the project area (Table 1). One of the endangered species is listed as nonessential/experimental for specific regions within the state of Montana. Specific surveys need not be conducted for the gray wolf or the Canada lynx because of the unlikely possibility of actually observing these species even if they are present. Instead, reconnaissance-level surveys for signs of these species (scat and tracks) will be included with other biological surveys at individual project sites. In addition, in habitats with higher potential for these animals, specific transects will be put in place and checked for scat. If found, hair and track traps for lynx and grizzly bears will be used to determine positive presence. If wolves are suspected, taped howling reconnaissance surveys will be employed to ascertain whether these species are using the area for denning.

### 3.2.3 BIRDS

One threatened, one endangered, and one proposed bird species are known or could occur in the project area. Specific surveys would include nesting surveys and winter foraging surveys. A detailed protocol for surveys for mountain plovers was provided by the FWS and is included in Appendix A. In general, mountain plover site clearance surveys will be conducted between local sunrise and 1000 hours and from 1730 hours to sunset. These time periods are important because of horizontal light factors that facilitate spotting the white breast of the adult plovers (Deibert 1999). The breeding season is considered to last from May 1 to June 15. Visual observation of the area will be made within 200 meters of the proposed well site to detect the presence of plovers. All plovers located will be observed long enough to determine if a nest is present. These observations will be made from within a stationary vehicle, as plovers do not appear to be wary of vehicles.

Consultation with local wildlife biologists will precede all exploratory CBM activities within 1.6 miles of any waterway. This consultation will result in obtaining nesting and winter foraging information for bald eagles that may be impacted by CBM activities. If nesting sites are known to occur within this radius of the proposed CBM site or sites, a biologist will be retained to survey specifically for this species for the duration of both the exploration and development phases in that locale. If the proposed CBM site is found to be within a nesting or winter foraging area, CBM work will be halted until the nest is no longer active or until winter has passed and the foraging eagles have migrated. BLM leasing stipulations pertaining to bald eagles apply and will be implemented.

Interior least terns are colonial nesting waterbirds that seldom swim, spending much of their time on the wing (Hubbard 1985). Therefore, clearance surveys that search for flying birds or nesting colonies will be done in appropriate habitats, sand bar river areas, or nearby sand pits, in the spring by a qualified biologist prior to exploration and well development.

### 3.2.4 PLANTS

Specific survey requirements for Ute ladies'-tresses orchids are given in Appendix C. Surveys will be conducted prior to any exploration or production activity that would affect wetlands, water bodies, or water courses.

## 4.0 PROJECT CONDITIONS

This section discusses habitat requirements and distributions of species listed or proposed for listing by the FWS as endangered or threatened, the status of the species or habitat within the project area, potential impacts from project implementation, conservation actions, and an impact determination. Habitat requirements and distribution data were obtained from Federal Register listing notices, conversations with federal and state biologists, and other published and unpublished research data.

## 4.1 Plants

### 4.1.1 UTE LADIES'-TRESSES (*SPIRANTHES DILUVIALIS*)

#### 4.1.1.1 Habitat

This plant was listed as threatened January 17, 1992 (57 FR 2053). It is found in moist soils in mesic or wet meadows near springs, lakes, or perennial streams (FWS 1995). It occurs primarily on sites subject to intermittent and unpredictable inundation, and the plants often emerge from shallow water (Sheviak 1984). The species occurs primarily in areas where the vegetation is relatively open and not overly dense, overgrown, or overgrazed (Coyner 1989, 1990; Jennings 1989, 1990). It has been found in Montana in wet meadows fed by stable groundwater, along meandered wetlands, and in seeps in alkaline valley bottoms (Heidel 1997). One of the Montana sites is a localized seep along a valley margin. The plant is commonly found along gravelly streamside reaches with a sand-silt texture, and is generally absent from areas with clayey soil, forested overstory, or stagnant water. Recent survey data indicate that the orchid tolerates naturally disturbed sites, such as point bars, because certain types of disturbance help maintain suitable habitat conditions, especially conditions related to plant community composition, structure, and seral stage.

Habitat for this orchid is dominated by wetland grass-forb communities below 7000 feet in elevation. Known sites in Montana are located between 4350 to 4800 feet in elevation. This species is often found in association with other wetland species. In Montana, these species are: few-flowered spikerush (*Eleocharis pauciflora*), Richardson's muhly (*Muhlenbergia richardsonii*), meadow sedge (*Carex simulata*), clustered field sedge (*Carex praegraclis*), saltwort (*Glaux maritima*), Baltic rush (*Juncus balticus*), inland rush (*Juncus longistylis*), and knotted rush (*Juncus nodosus*).

This orchid may exhibit prolonged dormancy. It can persist underground for several years before leaves emerge above ground, and it may not consistently flower in consecutive years. These dormancy periods are possible because of a symbiotic relationship with mycorrhizal fungi (FWS 1995). Plants with prolonged dormancy require special survey considerations because it may take 7 years of study to obtain 5 years of accurate information, and orchids occurring in drought- or flood-prone habitats may have both a higher proportions of dormant plants and longer periods of dormancy (Lesica and Steele 1994).

#### 4.1.1.2 Distribution

This species occurs in a few sites in Colorado, Utah, Idaho, Wyoming, and Montana.

It is known to occur only in southwestern Montana in the following counties: Beaverhead (1 individual counted), Gallatin (4 individuals), Jefferson (2 individuals), and Madison (4 individuals).

#### 4.1.1.3 Status in the Project Area

This species was first discovered in Montana in 1994. It is known to occur in only 10 populations in southwestern Montana, occupying habitat on less than 9 acres (Heidel 1997).

Unknown populations for this species may exist, because is able to remain dormant for several years at a time by relying on its symbiotic relationship with mycorrhizal fungi.

#### 4.1.1.4 Project Impact

This project may impact this species by affecting groundwater levels that maintain wetlands, wet meadows, and small seeps or through direct production water discharge to wetlands and intermittent and perennial streams. Water quality assimilative capacity limits will be set for water bodies in the project area by Montana Department of Environmental Quality (MDEQ). Because surface discharge would not be allowed to pass these levels, surface water discharge impacts are not expected to occur. If quantities of water are discharged, they are likely to inundate specific potential habitat for this species.

#### 4.1.1.5 Conservation Measures

No surveys were conducted for preparation of this BA, because of a lack of project-specific locations for implementation. To avoid impacts to this species, surveys will be conducted for 2 years prior to disturbance activities in suitable Ute ladies'-tresses habitat. Surveys shall be conducted according to FWS protocols. Search protocol guidelines are given in Appendix B for this species. If Ute ladies'-tresses are found to inhabit specific project locations where ground disturbance would occur, the FWS will be consulted prior to any disturbance to identify specific conservation measures to avoid impacts.

#### 4.1.1.6 Determination

The Preferred Alternative "may affect, but is not likely to adversely impact" Ute Ladies-tresses orchid if groundwater supplies supporting surface wetlands are protected and water is not introduced into wetlands with the effect of raising the water surface in the wetland.

## 4.2 Mammals

### 4.2.1 BLACK-FOOTED FERRET (*MUSTELA NIGRIPES*)

#### 4.2.1.1 Habitat

This species was listed as endangered March 11, 1967. Historically, black-footed ferrets inhabited grassland plains (shortgrass and midgrass prairies) surrounded by mountain basins up to 3250 meters (10500 feet) in elevation (FWS 1998).

This species is always found in association with another grassland species, the prairie dog (Cynomys spp.; Burt and Grossenheider 1980; Cahalane 1954). Prairie dogs are the principle food of the black-footed ferret, and prairie dog burrows provide the ferret's principle shelter. Research has found that the black-footed ferret is more than just associated with the prairie dog, but is truly obligate and dependent upon this rodent for its survival as a species (Anderson et al. 1986; Biggins et al. 1986, Clark 1989, Forrest et al. 1988, Henderson et al. 1974, Hillman 1968, Miller et al. 1996). Data suggest that a ferret needs a prairie dog colony of at least 12.5 hectares (31.3 acres) to survive for a year and a minimum of 50 hectares (125 acres) to raise a litter (Caughley and Gunn 1996). Ferret range is coincident with that of prairie dogs (Anderson et al. 1986). There is no documentation of black-footed ferrets breeding outside of prairie dog colonies. Specimen records of black-footed ferrets are available from ranges of three species of prairie dogs: The black-tailed prairie dog (*Cynomys ludovicianus*), white-tailed prairie dog (*Cynomys leucurus*), and Gunnison's prairie dog (*Cynomys gunnisoni*; Anderson et al. 1986).

Major causes for the decline in this species are long-term prairie dog control efforts, the loss of habitat as a result of destruction of original grasslands, and canine distemper (Frey and Yates 1996). Recovery plans were approved in June 1978 and August 1988. These included captive breeding and release to protected habitats in the wild.

#### 4.2.1.1 Distribution

Historically, this species' range included New Mexico, Arizona, Colorado, Utah, Kansas, Oklahoma, Texas, Wyoming, Nebraska, Montana, North Dakota, South Dakota, Alberta, and Saskatchewan. It was decimated from all of its former range, and distribution is now limited to introduced populations in Arizona, Wyoming, Montana, and South Dakota (FWS 1998). Reintroduction efforts have been concentrated in these four states because they still have protected areas with large prairie dog colonies. Although the Wyoming effort has been hampered by disease problems, the other three states have shown some success (FWS 1996). Reintroduction efforts were conducted in Wyoming from 1991 to 1994, Montana from 1994 to 2001, South Dakota from 1994 to 1996, and Arizona in 1996.

#### 4.2.1.3 Status in the Project Area

In 1994, ferrets were released into black-tailed prairie dog towns in northeastern Montana's C.M. Russell National Wildlife Refuge. In the spring of 1995, two or possibly three pairs produced at least five kits. In the fall of 1995, an additional 36 ferrets were released in another prairie dog town several miles from the first site. In December of 1995, a survey of both release sites documented 24 ferrets (eight at the first site and 16 at the second). In November 2001 20 ferrets were released in Phillips County. In Montana, the goal is to re-establish two viable populations with a minimum of 50 breeding adults in each population by the year 2010 (MFWP 2001).

The Montana Black-Footed Ferret Coordinating Committee has studied prairie dog towns capable of supporting black-footed ferrets. They are assessing the possibility of black-footed ferret reintroduction, and released a paper suggesting eight possible reintroduction sites in Montana. One of these sites is located in Custer County. If a proposal is made by the FWS and the MFWP to reintroduce the black-footed ferret, further coordination to avoid impacts will be required.

### 4.2.1.4 Project Impact

Black-footed ferrets are exclusively found associated with their main prey species: prairie dogs. Prairie dogs are found throughout the project area. Any activity affecting prairie dog colonies has the potential to impact the ferret. Prairie dog colonies are frequently located on level to slightly sloping ground, which are also prime locations for CBM exploration and development.

Two BLM leasing stipulations address black-footed ferret concerns. The first states that exploration in prairie dog colonies within potential black-footed ferret reintroduction areas comply with the *Draft Guidelines for Oil and Gas Activities in Prairie Dog Ecosystems Managed for Black-footed Ferret Recovery* (FWS and BLM). These guidelines are required and they specify that conditions of approval depend on the type and duration of the proposed activity, proximity to occupied ferret habitat, and other site-specific conditions. Exceptions or waivers of this stipulation may be granted if the Montana Black-Footed Ferret Coordination Committee determines that the proposed activity would have no adverse impacts on ferret reintroduction or recovery. The status of the Fort Belknap population allows them to be treated as a proposed species, which may require a conference with FWS if impacts are expected in the vicinity of the Reservation.

The second stipulation requires that all prairie dog colonies delete (or complexes) greater than 80 acres in size be surveyed for black-footed ferret absence or presence prior to ground disturbance. The results of the survey determine if restrictions or denial of use are appropriate for the site.

Permits issued for state lands do not have the same stated requirements for protection of dog towns of certain sizes; however, the ESA's protection of listed wildlife does apply to state and private land. Operators are prohibited from causing harm to the ferret.

### 4.2.1.5 Conservation Measures

Stipulation as discussed above will be implemented under the Preferred Alternative.

### 4.2.1.6 Determination

Strict adherence to BLM leasing stipulations will result in "may affect, but is not likely to adversely impact" to black-footed ferrets.

## 4.2.2 BLACK-TAILED PRAIRIE DOG (*CYNOMYS LUDOVICIANUS*)

### 4.2.2.1 Habitat

This species was proposed for listing as threatened on March 25, 1999. On February 3, 2000, the FWS determined that the black-tailed prairie dog warranted listing under the ESA. However, because there are other species also a waiting listing that are in greater need of protection, the FWS is not proposing to list the species at this time.

Black-tailed prairie dogs inhabit dry, upland prairies and grasslands (Burt and Grossenheider 1980). They are considered to be typical of Plains-Mesa Grasslands (Frey and Yates, 1996). This species is herbivorous and prefers various species of grasses, but they also eat the stem, leaves, and seeds of forbs and shrubs. Although they have also been reported to dig up bulbs for food, they apparently do not cache food underground (Hoffmeister 1986). Historically, colonies were often found even in marginal habitat, such as open woodlands and semidesert areas (Findley et al. 1975). This species is capable of colonizing a variety of shrub-grassland and grassland habitats. Generally, the most frequently used habitats in Montana are dominated by western wheatgrass (*Agropyron smithii*), blue grama (*Bouteloua gracilis*), and big sagebrush (*Artemisia tridentata*), and located in relatively level areas in wide valley bottoms, rolling prairies, and the tops of broad ridges (Knowles 1982).

The black-tailed prairie dog is considered to be a critical link (keystone) species because it provides critical habitat or habitat elements to a host of other species (Agnew et al. 1986; Finch 1992; Kotliar et al. 1999; Miller et al. 1994: Reading et al. 1989). These species include several species of special concern listed for this project: black-footed ferret, ferruginous hawk (*Buteo regalis*), swift fox (*Vulpes velox*), and mountain plover (*Charadrius montanus*; Finch 1992). The black-footed ferret is an obligate predator of prairie dogs.

Several factors have contributed to the decline of this once wide-spread species. Decades of extensive poisoning campaigns, sylvanic plague, and continual use of the species for target shooting are believed to be the major factors in their decline and continued suppression (Finch 1992). The fact that this species is considered to have low dispersal rates (King 1955) intensifies the effects of detrimental factors because they cannot migrate long distances to repopulate former habitat once extirpated from it.

### 4.2.2.2 Distribution

This species once ranged from Canada to northern Mexico (Hall and Kelson 1959). In the nineteenth century the distribution of prairie dogs was more or less continuous and their numbers were estimated at five billion (Seton 1953). Although the original abundance of prairie dogs in Montana is unknown, early accounts indicate they were widely distributed east of the Continental Divide (Cooper 1869a, 1869b; Coues 1878). Formerly, this species was particularly abundant east of the Continental Divide in grasslands and sagebrush-grasslands habitats (Hoffman and Pattie 1968).

Prairie dogs can still be found in scattered, wide spread populations throughout much of the range that it once occupied. However, there is evidence that there is as much as a 94 to 99 percent reduction in the amount of actual "occupied" habitat since 1900 (Barko 1997; Fagerstone and Ramey 1996; Knowles 1998; Mulhern and Knowles 1995; Wuerthner 1997). The U.S. Geological Survey estimates that the prairie dog occupies less than half a percent of its original range with an estimated 98 percent decline in population throughout North America (Mac et al. 1998).

### 4.2.2.3 Status in the Project Area

Although specific "colony" information is not available or incomplete, the species is known to be common in preferred habitats throughout the project area. Within Montana, an estimated 1,353 colonies cover 66,139 acres (FaunaWest 1999). These colonies average 49 acres in size.

### 4.2.2.4 Project Impact

As discussed in the black-footed ferret section, BLM has stipulations controlling surface use or activities that could impact black-tailed prairie dog towns larger than 80 acres and if ferrets are found to be present. However, these protections do not apply if the ferret is not present or to smaller towns. The state is developing a Prairie Dog Conservation Plan to address how to avoid continuing impacts, which are resulting in population declines. No special protective measures are being implemented by the state or BLM at this time, although an evaluation including associated impacts to other listed species to identify measures for avoiding impacts is required. Construction of CBM exploration and production wells on all land ownerships is expected to impact black-tailed prairie dog towns, possibly affecting individuals within colonies but not necessarily impacting the colony as a whole.

### 4.2.2.5 Conservation Measures

Surveys for black-tailed prairie dogs will be conducted in suitable habitat prior to project-specific development. Identified colonies will be evaluated for their use in the black-footed ferret reintroduction program. Project-specific conservation measures will be identified through consultation with FWS and MFWP.

### 4.2.2.6 Determination

Lack of specific protection measures or stipulations for this species may result loss of individuals. Implementation of the Preferred Alternative "is likely to affect but not adversely impact" black-tailed prairie dogs.

## 4.2.3 CANADA LYNX (*LYNX CANADENSIS*)

### 4.2.3.1 Habitat

This species was listed as threatened on March 24, 2000. In the contiguous United States, the distribution of the lynx is associated with the southern boreal forest, comprised of subalpine coniferous forest in the West, and primarily mixed coniferous/deciduous forest in the East (Aubry et al. 1999); whereas in Canada and Alaska, lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982; Quinn and Parker 1987; McKelvey et al. 1999). Within these general forest types, lynx are most likely to persist in areas that receive deep snow, for which the lynx is highly adapted (Ruggiero et al. 1999).

According to the US Forest Service (USFS) (1993a), lynx require three primary habitat components:

1. Foraging habitat (15- to 35-year-old lodgepole pine (*Pinus contorta*) to support snowshoe hare, the primary food source, and provide hunting cover.

2. Denning sites with patches of spruce and fir greater than 200 years old and generally smaller than 5 acres.

3. Dispersal and travel cover that is variable in vegetative composition and structure.

Abundance of snowshoe hare is the limiting factor for lynx. The hare is limited by the availability of winter habitat that includes early successional lodgepole pine with trees at least 6 feet tall.

Proposals for conservation networks connecting the Greater Yellowstone Ecosystem, the Northern Continental Divide, and the Salmon-Selway Region of Idaho are being developed around the needs of large mammals, particularly large carnivores (Noss et al. 1996). One of the main impacts to the success of this project will be the effect of roads. Roads are a major threat to carnivores because of their barrier effects, direct mortality from vehicle collisions, and increased access to poachers. Analysis of potential corridors for the proposed conservation network for the Northern Rockies indicates that only the western edge of the project area, including Gallatin and Park Counties, would be potentially impacted by CBM development (Walker and Craighead 1997).

### 4.2.3.2 Distribution

In the western United States, lynx historically occurred in the Cascades Range of Washington and Oregon; and the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado (McCord and Cardoza 1982; Quinn and Parker 1987).

### 4.2.3.3 Status in the Project Area

Distribution and primary potential habitats for Montana are in the western portion of the state in mature coniferous forests with a well-developed understory (Fisher et al. 1998).

### 4.2.3.4 Project Impact

Canada lynx would be expected mainly in higher elevation areas of western and south-central Montana, where dense, old-growth forests are most likely to be found. Although possible, exploration and development of CBM are not expected to occur in these habitats.

### 4.2.3.5 Conservation Measures

Any construction areas or drilling pads located in high elevation, old growth forested areas, especially areas with populations of hares or rabbits, would be surveyed prior to ground disturbance for scat and individuals following established protocols. If found, the site would be avoided and surrounded by a buffer zone recommended by FWS biologists.

### 4.2.3.6 Determination

Implementation of conservation measures will result in "no effect" to Canadian lynx.

## 4.2.4 GRAY WOLF (*CANIS LUPUS*)

### 4.2.4.1 Habitat

This species was listed as endangered on March 11, 1967. The gray wolf can be found in any area, within their current range, that supports populations of hoofed mammals (ungulates), its major food source. On November 18, 1994, a final rule initiated the establishment of a nonessential experimental population of gray wolves in central Idaho and southwest Montana (59 FR 60266).

### 4.2.4.2 Distribution

The wolf was considered extirpated from the western portion of the conterminous United States by about 1930. The gray wolf is native to most of North America north of Mexico City, except for the southeastern United States, where a similar species, the red wolf (*Canis rufus*), was found. The gray wolf occupied nearly every area in North America that supported populations of hoofed mammals (ungulates). The gray wolf occurred historically in the northern

Rocky Mountains, including mountainous portions of Wyoming, Montana, and Idaho. For 50 years prior to 1986, no detection of wolf reproduction was found in the Rocky Mountain portion of the United States.

A revised recovery plan was approved by FWS in 1987 (FWS 1987). It identified a recovered wolf population as being at least 10 breeding pairs of wolves, for 3 consecutive years, in each of three recovery areas (northwestern Montana, central Idaho, and Yellowstone). A population of this size would be comprised of about 300 wolves. The plan recommended natural recovery in Montana and Idaho. The plan recommended use of ESA section 10(j) authority to reintroduce experimental wolves. By establishing a nonessential experimental population, more liberal management practices could be implemented to address potential negative impacts or concerns regarding the reintroduction. The final EIS was filed with the Environmental Protection Agency on May 4, 1994, and the notice of availability was published on May 9, 1994. The EIS considered five alternatives: 1) Reintroduction of Wolves Designated as Experimental; 2) Natural Recovery (No Action); 3) No Wolves; 4) Wolf Management Committee Recommendations; and 5) Reintroduction of Wolves Designated as Non-experimental. After careful review, the FWS proposed to reintroduce nonessential experimental gray wolves in Yellowstone Park and central Idaho. Wolves in the third recovery area, the Northwest Montana Recovery Area encompassing northwest Montana and the Idaho Panhandle, are covered fully by the ESA as endangered species. Under the Experimental Population Final Rule guidelines from 1994, 35 wolves were introduced into central Idaho and 66 wolves were introduced into Yellowstone National Park in 1995 and 1996.

### 4.2.4.3 Status in the Project Area

The Yellowstone Park population is the only one likely to be impacted by this project. By the end of 2000, at least 177 wolves in 18 packs (including 13 breeding pairs) were present in the Greater Yellowstone Area (FWS et al. 2001). Wolves are now beginning to migrate from the Yellowstone Park area into other areas of south-central Montana.

### 4.2.4.4 Potential Impact

Roads and the presence of humans would increase the threat from shooting, either intentionally or accidentally (if mistaken for a coyote). The density of roads in occupied wolf areas could force wolves from occupied areas and could increase stress on wolves and result in the loss of some individuals.

### 4.2.4.5 Conservation Measures

Prior to construction on state lands and counties bordering Yellowstone National Park (Gallatin and Park Counties), surveys would include specific searches for this animal, occupied dens, or scat. The corridor would be surveyed in the spring, before construction by a wildlife biologist for scat. If scat is found, the site would be surrounded by a buffer zone recommended through consultation with an FWS biologist. If wolves or other wolf indicators are found, FWS would be consulted and proper protocols followed.

### 4.2.4.6 Determination

Implementation of conservation measures would result in "no effect" on gray wolf.

## 4.2.5 GRIZZLY BEAR (*URSUS ARCTOS HORRIBILIS*)

### 4.2.5.1 Habitat

This species was listed as endangered on March 11, 1967. This status was changed to threatened on July 28, 1975. On November 11, 2000, the FWS listed some populations in Montana and Idaho as experimental to facilitate restoration to designated recovery areas. On June 20, 2001, Interior Secretary Gale Norton rescinded the plans for restoration and withdrew a plan to reintroduce grizzly bears into the Bitterroot ecosystem of Idaho and Montana. Current status for is this species is threatened.

The grizzly (or brown) bear was once found in a wide variety of habitats including open prairie, brushlands, riparian woodlands, and semidesert scrub. Most populations require vast areas of suitable habitat to prosper. They forage for wild fruits, nuts, bulbs, roots, insect larvae in logs, and carcasses of elk, deer and cattle (Graham 1978; Mealey 1975; Schleyer1983). This species is common only in habitats where food is abundant and concentrated, including white-bark pine, berries, and salmon or cutthroat runs, and where conflicts with humans are minimal (Reinhart 1990;

Podruzny1999). Research indicates it is important to maintain areas where grizzly bears can forage for a 24 to 48 hour period secure from human disturbance (Gibeau *et al.* 1996).

Winter dens are dug in north-facing slopes or more often at the base of large trees in areas away from humans in late fall or winter after snow has begun to fall (Crowed and Crowed 1972; Jonkel 1980; Judd et al. 1986;Vroom et al. 1980).

#### 4.2.5.2 Distribution

This species once lived in a variety of habitats across most of North America. Grizzly bears now occupy only 2 percent of their original range in the lower 48 states in remote wilderness areas in Idaho, Montana, Wyoming, Alaska and Washington. At least 350 grizzlies live in the northwestern Montana Rocky Mountains, about 250 in or around Yellowstone National Park, about 25 in the Selkirk Mountains in northern Idaho and northeast Washington, another 20 or so in the Cabinet-Yaak ecosystem in northern Idaho and western Montana, and 5 to 20 in the North Cascades. In Alaska, where they are called brown bears, they are estimated to number more than 30,000. There are about 22,000 grizzly bears in Canada.

#### 4.2.5.3 Status in the Project Area

This species no longer exists in the wild in eastern Montana. Its distribution in Montana is now limited to the Northern Continental Divide Ecosystem and the Yellowstone Ecosystem with a few in the Cabinet-Yaak Ecosystem. The Primary Conservation Area for this species extends beyond the boundary of Yellowstone National Park into the Gallatin and Custer National Forests in Montana. By 1996, a record 33 females with cubs were observed in the Yellowstone ecosystem, and the bear population there is now increasing at 4 to 6 percent per year. This increasing population has been expanding into adjacent suitable habitat areas throughout the 1990s (FWS 1993b). The two primary areas within the CBM project area are in Gallatin County and the Southern Absarokas (Haroldson and Ternent 1999).

#### 4.2.5.4 Potential Impact

Threats to grizzly bears mainly result from human-bear interactions, which occasionally ends in the death of the grizzly bear. If exploration moves into sparsely settled areas or previously unroaded areas within grizzly bear range, the possibility of bear-man interaction increases.

#### 4.2.5.5 Conservation Measures

Garbage and other human refuse would be removed from drilling and construction sites in potential bear habitat to avoid attracting bears. Surveys for scat and other sign of grizzly bears in remote, sparsely roaded areas would be conducted prior to construction. If found, protocol would be established after consultation with FWS biologists.

#### 4.2.5.6 Determination

Implementation of conservation measures would result in "no effect" to grizzly bear.

## 4.3 Birds

### 4.3.1 MOUNTAIN PLOVER (*CHARADRIUS MONTANUS*)

#### 4.3.1.1 Habitat

The mountain plover has been proposed for listing as threatened. This bird's habitat is grasslands and it has historically associated with bison, pronghorn, and burrowing rodents. Breeding sites typically have vegetation that is less than 10 cm high with at least 30 percent bare ground and less than 5 percent slope. Chosen nest sites generally are heavily grazed areas with a manure pile, rock, or clump of forbs nearby (Leachman and Osmundson 1990; Parrish 1988; Parrish et al. 1993; Tolle 1976). Vegetation commonly associated with nest sites in Colorado are blue grama), buffalo grass (*Buchloe dactyloides*), and prickly pear cactus (Opuntia). Although this plover is rarely found near natural water sources, they are found near stock tanks (Knowles 1996). They are attracted to sites that are disturbed by grazing or burning (Wallis and Wershler 1981). They will use tilled land, but the farming techniques need to accommodate their life history, which rarely happens (Shackford et al. 1999).

Conversion of native prairies to agriculture has significantly reduced suitable breeding habitats for this species. It prefers level sites with very short grass and scattered cactus (Graul 1975). Intensive grazing is beneficial for mountain plovers, and they also regularly occupy prairie dog towns (Knowles et al. 1982). In Montana, high, arid plains and shortgrass prairie with blue grama and buffalo grass are primary habitat (Fisher et al. 1998). It does not overwinter in Montana, but potentially may breed within the project area, particularly if black-tailed prairie dog towns are present.

#### 4.3.1.2 Distribution

The breeding range for this plover ranges from Colorado, Montana, Wyoming, Kansas, and Nebraska down through Oklahoma, Kansas, Utah, Nevada, Texas, and New Mexico. Almost 90 percent of mountain plovers winter in California in the Central and Imperial Valleys. The remainder apparently winter in Arizona, Texas, and Mexico.

This species currently has a population of less than 10,000 birds, a decline of 50 percent since 1966. This is the highest rate of decline of any grassland bird. The decline in this species is primarily caused by plowing, sodbusting, range management practices, oil and gas activity, prairie dog control, and pesticide use.

#### 4.3.1.3 Status in the Project Area

The status of the mountain plover is not well understood within the project area, but may breed within the planning area, particularly in black-tailed prairie dog towns. It currently breeds in central, north-central, and southwest Montana and is transitory in other parts of Montana, such as the Greater Yellowstone Ecosystem. Blaine and Phillips counties currently support the bulk of mountain plovers that nest in Montana.

#### 4.3.1.4 Project Impact

Mountain plover are most susceptible to disturbance during the nesting season, which extends from mid-April through early July. Construction activity and operations and maintenance could disturb the nesting/courting birds during this period. Noise and the presence of humans and equipment would be the main causes of disturbance. The absence of stipulations to protect mountain plover nesting areas (prairie dog towns smaller than 80 acres and even larger ones if no black-footed ferrets are present) would result in impacts to this species if exploration or development occurs in or near occupied nesting habitat. Prairie dog towns, often located on flat topography in low areas, are also preferred by CBM developers. Recent hatchlings are particularly susceptible to vehicle-related fatalities.

#### 4.3.1.5 Conservation Measures

Surveys will be made for all prairie dog towns within the roadway corridor and pad sites. If prairie dog colonies or several of the other indicators are found, FWS survey protocol for this species will be followed. This includes surveying during breeding season for presence or absence on potential sites. Construction will be avoided in these areas during this time period to assure that potential nesting mountain plovers are not prevented from setting up territories resulting from the presence of equipment and humans.

#### 4.3.1.6 Determination

Implementation of conservation measures to avoid impacts to nesting birds will help minimize impacts to this species. However, because these measures likely fall short of total protection the proposed action is "likely to adversely affect" mountain plovers.

### 4.3.2 BALD EAGLE (HALIAEETUS LEUCOCEPHALUS)

#### 4.3.2.1 Habitat

This species was reclassified from endangered to threatened, because of recovery status, on July 12, 1995. Bald eagles concentrate in and around areas of open water where waterfowl and fish are available. They prefer solitude, late-successional forests, shorelines adjacent to open water, a large prey base for successful brood rearing, and large, mature tree for nesting and resting (Fisher et al. 1998).

### 4.3.2.2 Distribution

The bald eagle ranges throughout much of North America, nesting on both coasts from Florida to Baja California, Mexico in the south, and from Labrador to the western Aleutian Islands, Alaska in the north. An estimated quarter to a half million bald eagles lived on the North American continent before the first Europeans arrived. Nationwide bald eagle surveys, conducted in 1973 and 1974 by the FWS, other cooperating agencies, and conservation organizations, revealed that the eagle population throughout the lower 48 states was declining. A partial survey conducted by the National Audubon Society in 1963 reported on 417 active nests in the lower 48 States, with an average of 0.59 young produced per nest. Surveys coordinated by FWS in 1974 resulted in a population estimate of 791 occupied breeding areas for the lower 48 States. The FWS estimated that the breeding population exceeded 5,748 occupied breeding areas in 1998. The bald eagle population has essentially doubled every 7 to 8 years during the past 30 years.

### 4.3.2.3 Status in the Project Area

Bald eagles nest along all the major rivers within planning area. These watersheds provide important habitat during spring and fall migrations. As well as during the winter months. Bald eagles have been expanding their nesting territories throughout south central and southeastern Montana (Flath 1991).

### 4.3.2.4 Project Impact

Bald eagles are sensitive to human presence. Disturbance to foraging, resting, roosting, or migrating eagles is possible through surface use in other areas not addressed by stipulations. Assumptions listed in the introduction of the Wildlife section (Chapter 4 Wildlife), in the Powder River and Billings Amendment to the RMPs and EIS, including no surface use or occupancy within 1/2 mile of nests active in the last 7 years and within riparian area nesting habitat, should prevent eagles from abandoning traditional nesting sites in the project area, but periodic or complete abandonment of non-nesting habitat may occur depending on the level of human use and noise. Above-ground transmission facilities, even with proper design and construction requirements (APLIC,1996), pose an electrocution threat to bald eagles. Power lines also pose strike hazards for bald eagles, especially near perennial rivers and water bodies that support fish and waterfowl. Removal of large trees in wintering areas, particularly at established roost sites, would also displace bald eagles by removing perch and roost sites. Increased traffic, road kills and carrion, resulting from CBM activities, potentially increases vehicle collision hazard to bald eagles.

### 4.3.2.5 Conservation Measures

Before construction begins, a wildlife biologist will survey the construction zone within a 0.5-mile width for bald eagles and bald eagle nests and identify any locations that are found. No surface occupancy or use within 0.5 miles of known nests or riparian nesting habitat should prevent impacts to nesting bald eagles. APLIC (1996) guidelines will be applied to all above-ground transmission facilities.

### 4.3.2.6 Determination

The Proposed Action is " likely to adversely affect" bald eagles.

## 4.3.3 INTERIOR LEAST TERN (*STERNA ANTILLARUM ATHALASSOS*)

### 4.3.3.1 Habitat

This species was listed as Endangered on 28 May 1985 (50 FR 21784-21792).

The occurrence of breeding least terns is localized and depends upon the presence of dry, exposed sand bars and favorable river flows that support desired forage fish and that also isolate the sand bars from the river banks. Characteristic riverine nesting sites are dry, flat, sparsely vegetated sand and gravel bars within a wide, unobstructed, water-filled river channel (Ziewitz et al. 1992). The sand at a nesting site must be mostly clear of vegetation, and water levels low enough for nests to remain dry. Nests are initiated only after spring and early summer flows recede and dry areas on sand bars are exposed, usually on higher elevations away from the water's edge. Artificially created nesting sites, such as sand and gravel pits, dredge islands, reservoir shorelines and power plant ash disposal areas, also are used occasionally as well (Kirsch 1996).

### 4.3.3.2 Distribution

The interior least tern breeds locally along the major tributaries of the Mississippi River from eastern Montana south to Texas and Louisiana and east to western Illinois, Missouri, and Arkansas.

### 4.3.3.3 Status in the Project Area

The least tern is known to nest in the planning area. Its habitat includes graveled islands in the lower Yellowstone River and the Missouri River below Fort Peck dam (Fisher et al. 1998).

### 4.3.3.4 Project Impact

As with mountain plover, this species is susceptible to disturbance during the nesting period. It is highly vulnerable to changes in water levels during the nesting period. Implementation of conservation measures would avoid impacts to this species.

### 4.3.3.5 Conservation Measures

Potential habitat near drilling and construction sites will be identified and appropriate surveys will be conducted for this species. Surface occupancy and use is prohibited within 1/4 mile of wetlands used by nesting interior least tern during exploration. This stipulation will prevent impacts to interior least tern. Occupied wetlands and water levels would be protected in all phases of drilling and construction and no discharge into occupied wetlands would be permitted.

### 4.3.3.6 Determination

With strict adherence to survey protocols, stipulations and conservation measures, this project will likely have "no effect" interior least terns.

# 4.4 Fish

## 4.4.1 PALLID STURGEON (*SCAPHIRHYNCHUS ALBUS*)

### 4.4.1.1 Habitat

This species was listed as endangered on September 6, 1990 (55 FR 36641). They are found in large rivers with high turbidity and a natural flow with rocky or sandy substrates (Forbes and Richardson 1905). They evolved in large rivers with high turbidity and a natural hydrograph that included spring flooding and other high runoff events. Preferred habitat has a diversity of depths and velocities formed by braided channels, sandbars, islands, sand flats and gravel bars (Erickson 1992, Gilbraith et al. 1988). Pallid sturgeon are usually found now in deeper holes below sandbars and in riverine reaches of reservoirs (Kallemeyn 1983, Erickson 1992, Clancey 1991).

### 4.4.1.2 Distribution

Historically, pallid sturgeon were found in the Missouri River from Fort Benton, Montana, to St. Louis, Missouri; in the Mississippi River from above St. Louis to the Gulf of Mexico; in the lower reaches of other large tributaries, such as the Yellowstone, Platte, Kansas, Ohio, Arkansas, Red, and Sunflower; and in the first 60 miles of the Atchafalaya River (Bailey and Cross 1954, Kallemeyn 1983).

### 4.4.1.3 Status in the Project Area

Historically in Montana, pallid sturgeon occupied reaches of the Missouri River from Fort Benton downstream and in the Yellowstone River from Miles City to the Missouri River (FWS 1993a). Natural water flow and natural flooding events have been changed by channel developments and hydroelectric projects. These changes coupled with pollution and fishing, are believed to be the main reason for the decline in this species. There are three priority recovery management areas in Montana, two on reaches of the Missouri and one on the Yellowstone River.

### 4.4.1.4 Project Impact

There could be a minimal, temporary affect through construction of stream crossings and erosion generated by construction activities. The Preferred Alternative contains requirements designed to protect hydrologic resources by combining management options of CBM-produced water so that no degradation of water quality would be allowed in any watershed. CBM operators would be required to develop a Water Management Plan as part of their overall Project Plan that describes how impacts on surface resources would be minimized or mitigated, and how a discharge (if proposed by the operator) could occur without damaging the watershed—in accordance with a required and approved NPDES Permit and water quality laws. Stipulations prohibiting surface occupancy or use of water bodies, floodplains of major rivers, riparian areas, and steep slopes would further avoid impacts. These measures would avoid water quality impacts to the pallid sturgeon. In addition, release of adequate quality water from production may improve habitat that has been degraded through water withdrawals.

Long-term effects on pallid sturgeon associated with discontinued activities, such as sediment delivery from roads, would subside as disturbed areas are reclaimed. Agency mitigation measures implemented during abandonment would reduce erosion potential, prevent water pollution, facilitate reclamation of disturbed lands, and further reduce the potential for long-term impacts on pallid sturgeon.

### 4.4.1.5 Conservation Measures

There are no specific conservation measures identified, however, BLM would develop, include, and enforce appropriate mitigation measures for aquatic resources, including pallid sturgeon, during the site-specific, plan-approval stage. Measures to further avoid or reduce impacts in addition to those included at the plan-approval stage may be recommended. The state would apply additional mitigation measures on a case-by-case basis through the use of field rules.

### 4.4.1.6 Determination

If Conservation Measures are implemented, this project "may affect but is not likely to adversely impact" pallid sturgeon.

## 4.4.2 MONTANA ARCTIC GRAYLING (*THYMALLUS ARCTICUS*)

### 4.4.2.1 Habitat

This species is a candidate for listing under the Endangered Species Act. On October 2, 1991, a petition requested that the "fluvial Arctic grayling" be listed as an endangered species throughout its historic range in the lower 48 states. The petitioners stated that the decline of the fluvial Arctic grayling was a result of many factors, including habitat degradation because of the effects of domestic livestock grazing and stream diversions for irrigation, competition with nonnative trout species, and past over-harvesting by anglers. Additionally, the petition stated that much of the annual recruitment is lost in irrigation ditches.

### 4.4.2.2 Distribution

Historically, this species was widely, but irregularly, distributed and locally abundant above Great Falls in the upper Missouri River drainage in Montana. (FWS 1994).

### 4.4.2.3 Status in the Project Area

In Montana, Arctic grayling are generally found at relatively high, cold headwater locations. Within the project area these locations include headwaters in the Gallatin River and the Clarks Fork of the Yellowstone. Studies by the Montana Department of Fish, Wildlife and Parks show that grayling relative abundance at both of these locations is "rare" (Montana Natural Resource Information System 2001).

### 4.4.2.4 Project Impact

There could be a minimal, temporary affect through construction of stream crossings and erosion generated by construction activities. The Proposed Action contains requirements designed to protect hydrologic resources by combining management options of CBM-produced water so that no degradation of water quality would be allowed in any watershed. CBM operators would be required to develop a Water Management Plan as part of their overall

Project Plan that describes how impacts on surface resources would be minimized or mitigated, and how a discharge (if proposed by the operator) could occur without damaging the watershed—in accordance with a required and approved NPDES Permit and water quality laws. Stipulations prohibiting surface occupancy or use of water bodies, floodplains, riparian areas, and steep slopes would further avoid impacts. These measures would avoid water quality impacts to the Arctic grayling. In addition, release of adequate quality water from production may improve habitat that has been degraded through water withdrawals.

Long-term effects on the Montana arctic grayling associated with discontinued activities, such as sediment delivery from roads, would subside as disturbed areas are reclaimed. Agency mitigation measures implemented during abandonment would reduce erosion potential, prevent water pollution, facilitate reclamation of disturbed lands, and further reduce the potential for long-term impacts on Arctic grayling.

### 4.4.2.5 Conservation Measures

There are no specific conservation measures identified, however, BLM would develop, include, and enforce appropriate mitigation measures for aquatic resources, including Arctic grayling, during the site-specific, plan-approval stage. Measures to further avoid or reduce impacts in addition to those included at the plan-approval stage may be recommended. The state would apply additional mitigation measures on a case-by-case basis through the use of field rules.

### 4.4.2.6 Determination

With implementation of Conservation Measures the planned action "may affect but is not likely to adversely impact" this species.

# 4.5 Invertebrates

## 4.5.1 WARM SPRING ZAITZEVIAN RIFFLE BEETLE (*ZAITZEVIA THERMAE*)

### 4.5.1.1 Habitat

This riffle beetle is a Candidate for listing under the Endangered Species Act. It is endemic to a single warm springs near Bozeman, Montana and is not known to inhabit any other sites (Nordstrom, L. 2001. Personal Comm. FWS Helena, MT).

### 4.5.1.2 Distribution

There is only one known population of this species. It is found in an unnamed hot springs on Bridger Creek on the outskirts of Bozeman in Bridger County. It is globally endemic to this one place (Nordstrom, L. 2001. Personal Comm. FWS Helena, MT).

### 4.5.1.3 Status in the Project Area

The single known population of this species is currently stable.

### 4.5.1.4 Project Impact

Anything, including drawdown of the water table that impacts the hot springs where this species is found may cause the extinction of the species (Nordstrom, L. 2001. Personal Comm. FWS Helena, MT).

### 4.5.1.5 Conservation Measures

There will be no CBM well development allowed near Bozeman, and no water will be removed or added to the Bridger Creek drainage above the hot spring. All other warm springs within the project area that may be potentially impacted by this project will be surveyed for this species before exploration and development of CBM wells begins.

#### 4.5.1.6 Determination

Implementation of survey protocols and conservation measures to known and potential populations would result in "no effect" to this species.

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BOI013180004.DOC/LH

Appendix A

# Letter from USFWS with Species of Concern

Ecological Services
100 North Park, Suite 320
Helena Montana 59601

ES-61130-Billings
Informal

April 17, 2001

Mr. Larry Rau
Bureau of Land Management
Miles City Field Office
111Garyowen Road
Miles City, Montana 59301

Dear Mr. Rau:

We have received your April 6, 2001 FAX of your 28 February 2001 letter regarding the development of a joint Draft Environmental Impact Statement with the Montana Department of Natural Resources and Conservation (DNRC) addressing oil and gas development. The analysis specifically addresses coalbed methane development in southeast and east central portions of Montana. Under a "full development" scenario, the following counties may be affected by this action: Treasure, Rosebud, Powder River, Wheatland, Golden Valley, Musselshell, Sweet Grass, Stillwater, Yellowstone, Big Horn, Carbon, Blaine, Park, Gallatin, Carter and Custer Counties. The Bureau of Land Management (BLM) is requesting comments and concerns on the impacts of the proposed action on the following threatened, endangered and proposed species.

The threatened, endangered or proposed species which may occur in the identified counties include the bald eagle *Haliaeetus leucocephalus*, pallid sturgeon *Scaphirhynchus albus,* grizzly bear *Ursus arctros horribilis*, Canada lynx *Lynx canadensis*, Utre Ladies' Tresses *Spiranthes diluvialis*, gray wolf *Canis lupus*, interior least tern *Sterna antillarum athalassos*, black footed ferret *Mustela nigripes* and mountain plover *Charadrius montanus.*

The Peregrine falcon (*Falco peregrinus*) was delisted on August 25, 1999. Protection from take and commerce for the peregrine falcon under the Endangered Species Act is removed upon delisting. However, peregrine falcons are still protected by the Migratory Bird Treaty Act (MBTA). The MBTA and its implementing regulations (50 CFR Parts 20 and 21) prohibit take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase or barter, any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit (50 CFR 21.11). With limited exceptions, take will not be permitted under MBTA until a management plan developed in cooperation with State wildlife agencies, undergoes public review, is approved, finalized, and published in the Federal Register.

Your action in Blaine County may occur within a "nonessential experimental population" for the black-footed ferret (50 CFR Part 17, Vol. 59, No. 159, 42696-715, August 18, 1994). Section 10(j) of the Act authorizes listed species to be released as experimental populations outside their currently occupied range, but within probable historic habitat, to further species conservation. Before making a release, the Services determine by rulemaking whether that population is "essential" or "nonessential." An "essential experimental population" is a reintroduced population whose loss would be likely to appreciably reduce the likelihood of the survival of the species in the wild. A "nonessential experimental population" is a reintroduced population whose loss would not be likely to appreciably reduce the likelihood of survival of the species in the wild. For section 7 consultation purposes, section 10(j) requires that any nonessential experimental population outside a National Park or National Wildlife Refuge System unit is treated as a proposed species and a conference with the Service may be conducted. It should be noted, that the effects of your proposed action may occur outside this area where the status of the black-footed ferret remains as endangered.

The black-footed ferret is obligate to the black-tailed prairie dog and is found exclusively within prairie dog colonies except when traveling from one colony to another. The Assiniboine and Gros Ventre Tribes at Fort Belknap are a part of the black-footed ferret reintroduction effort in Montana. A total of 167 ferrets have been released on the Fort Belknap Indian Reservation between 1997 and 2000. Therefore, black-footed ferrets may reside in any active prairie dog town within the scope of effects in the action area. A copy of the Service's *Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act" (April 1989)*, is available upon request.

In Montana, the mountain plover almost exclusively nests in active prairie dog towns. Blaine and Phillips counties both support the bulk of mountain plover that nest in Montana. This population demonstrates the highest reproductive success of the few remaining within its historic range. The contribution of this local population's recruitment to the species is significant to the point that its loss would be a severe blow to recovery of the species. The Service has established *Mountain Plover Survey Guidelines (1999)* that have been provided for your convenience as APPENDIX I to this letter.

Candidate species are those taxa for which the U.S. Fish and Wildlife Service has sufficient information on biological status and threats to propose to list them as threatened or endangered, but issuance of a proposed rule is currently precluded by higher priority listing actions (61 FR 7596-7613, February 28, 1996). The Service encourages their consideration in environmental planning and partnerships; however, none of the substantive or procedural provisions of the Act apply to candidate species. Federal agencies have policies for the conservation of federal candidate species to manage those species in such a manner as to ensure actions that they authorize, fund, or carry out do not contribute to the need to list any species, and they may have special agency guidelines for their management, i.e. The Bureau of Land Management Instruction Memorandum No. 2000-140. The candidate species found in the counties listed above, includes the black-tailed prairie dog *Cynomys ludovicianus,* Montana arctic grayling *Thymallus arcticus*, and warm spring Zaitzevian riffle beetle *Zaitzevia thermae.* On April 10, 2001, the Service made a 12-month finding for a petition to list the sicklefin chub *Hybopsis meeki* and the sturgeon chub *Hybopsis gelida* as endangered under the Endangered Species Act of 1973, as amended. We found, after review of all available scientific and commercial information, that listing either of these two species is not warranted at this time. However, significant concern for these species remains.

The Service was petitioned to list the sage grouse (*Centrocercus europhasia*) in the state of Washington on May 14, 1999. Depending upon the Service's finding, a new petition may be submitted requesting to list the sage grouse throughout its range. Sage grouse populations have been declining throughout their range. Habitat loss and fragmentation has been identified as one of the primary causes of this decline. This species is dependent on sagebrush, and any removal of this habitat component can have a potentially negative effect on this species. Re-establishment of this shrub by existing coalmines to 30% of pre-disturbance levels has been largely unsuccessful in the Powder River Basin. Additionally, sage grouse are negatively impacted by increased road densities. Indirect impacts to sage grouse are likely, and that surface and timing stipulations are unsuccessful in protection of sage grouse habitat due to split estate mineral ownership. Cumulative surface disturbance of habitat from mining, coal-bed methane production, and oil and gas development may directly affect sage grouse populations. If sage grouse are listed during development of your proposed activity, the need to consult under section 7 of the Act may be avoided by addressing project impacts to this species now.

Pursuant to Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.), the Bureau of Land Management, as the responsible Federal agency, must determine if the proposed actions may affect these listed species and if so, initiate formal consultation with the Fish and Wildlife Service (Service). In order to determine if formal consultation is required, the Service recommends the responsible agency prepare a biological assessment for construction projects requiring an environmental impact statement (refer to Section 402.12, 50 CFR, Part 402, June 3, 1986), or an equivalent analysis for other projects, in accordance with Section 402.14, 50 CFR, part 402. We recommend that biological assessments include the following:

1. A description of the project,

2. A description of the specific area that may be affected by the action,

3. The current status, habitat use, and behavior of threatened and endangered species in the project area,

4. Discussion of the methods used to determine the information in Item 3,

5. An analysis of the affects of the action on listed species and proposed species and their habitats, including an analysis of any cumulative effects (see Section 402.02 50 CFR, Part 402),

6. Coordination/mitigation measures that will reduce/eliminate adverse impacts to threatened and endangered species,

7. The expected status of threatened and endangered species in the future (short and long term during and after project completion),

8. A determination of the project affects for listed species,

9. A determination of "is likely to jeopardize" or "is not likely to jeopardize" for proposed species, and

10. Documentation of the basis of all conclusions, such as the data considered, citation of literature and personal contacts used in developing the assessment.

If it is determined that the proposed project is likely to adversely affect any listed species, formal consultation should be initiated with this office.

Section 9 of ESA prohibits knowingly taking listed species, which includes harm, harassment, capture, or collection activities, except when specifically permitted by the U.S. Fish and Wildlife Service. Please also be apprized of the potential application of the Migratory Bird Treaty Act of 1918 (MBTA), as amended, 16 U.S.C. 703 et seq; and the Bald Eagle Protection Act of 1940 (BEPA), as amended, 16 U.S.C. 668 et seq; to your project. The MBTA does not require intent to "take" to be proven and does not allow for "take," except as permitted by regulations. Section 703 of the MBTA provides: "Unless and except as permitted by regulations...it shall be unlawful at any time, by any means or in any manner, to...take, capture, kill, or attempt to take, capture, or kill, possess... any migratory bird, or any part, nest, or eggs of any such bird...." The BEPA prohibits knowingly taking, or taking with wanton disregard for the consequences of such an activity, any bald or golden eagles or their body parts, nest, or eggs, which includes collection, molestation, disturbance, or killing activities.

Executive Order 13186 for Migratory Bird Conservation was signed by President Clinton on January 10, 2001 and published in the Federal Register on January 17, 2001. Executive Order 13186 reaffirms that Federal Agencies are in fact subject to the Migratory Bird Treaty Act and the executive order provides an effective mechanism for implementing the United States' obligations under its treaties with Canada, Mexico, Russia, and Japan. The requirements of the Executive Order are in addition to, not in lieu of, the prohibitions of the MBTA. Federal Agencies are required to possess permits before taking migratory birds.

The Service does foresee many substantive issues with the proposed project with regard to listed or other protected species, and the proliferation of new power lines to water wells and new infrastructure is a concern. Any power lines in the vicinity, if not properly constructed, could pose electrocution and line strike hazards to listed species and other migratory birds. To conserve any listed species and other migratory birds protected by Federal law, we urge that any power lines that may need to be modified or reconstructed as a result of the project be raptor-proofed following the criteria and techniques outlined in the *Avian Power Line Interaction Committee (APLIC). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington, D.C., 78 pp*, and *Avian Power Line Interaction Committee (APLIC). 1996. Suggested Practices for Raptor Protection on Power Lines. Edison Electric Institute/Raptor Research Foundation, Washington, D.C., 128 pp.*

Copies can be obtained via the Internet at http://www.eei.org/resources/pubcat/enviro/, or by calling 1-800/334-5453).

In Montana, recent studies have identified increasing eagle and raptor mortalities when birds encounter electric power lines associated with oil and gas development. All new distribution lines should incorporate contemporary raptor protection measures. These include conventional conductor-conductor and conductor to ground spacing, insulating the bushing conductor terminations and by using insulated jumper conductors. Perches, perching deterrents, nesting platforms and nest deterrent devices should also be used.

Your letter does not mention whether wetlands might be impacted by any of the proposed projects. If so, Corps of Engineers Section 404 permits may eventually be required. In that event, depending on permit type and other factors, the U.S. Fish and Wildlife Service may be required to review permit applications and will recommend any protection or mitigation measures to the Corps of Engineers as may appear reasonable and prudent based on the information available at that time.

Coal bed methane (CBM) development will include extensive networks of pipelines, power lines and roads, which together with collection points and compressors will result in severe disturbance to terrestrial wildlife and the habitats that support them. Saline runoff from CBM wells will also affect terrestrial wildlife through loss of habitat and direct physiological impacts.

Within the affected area, six species of amphibians, 12 species of reptiles, 184 species of birds and 43 species of mammals occur. Some are secure, and could likely weather the effects of CBM development, but the status of most is unknown, as is their potential response to the proposed development. Of the 245 vertebrate species (excluding fish), 13 species and 4 communities are of concern. Attached as an addendum to this letter is a paper by Steve Regele and Judd Stark from the Montana Department of Environmental Quality on *Coal Bed Methane Gas Development in Montana, Some Biological Issues.*

CBM development will draw down existing local and regional aquifers and reduce important ground and surface water supplies. Stock ponds, springs and wells will provide less water for livestock in upland areas, resulting in hardships for local livestock producers, and forcing cattle to use riparian areas for water. Increased livestock use of riparian habitats would violate the *Standards for Rangeland Health and Guidelines for Livestock Grazing Management* adopted by the BLM in the May, 1997 final EIS.

Wastewater discharge will likely cause increased flows in normally dry watercourses such as ephemeral drainages, coulees and gullies resulting in erosion and downstream siltation in streams that are already silt laden. These waters may contain toxic elements hazardous to wildlife. The MT DEQ has identified 22 parameters of concern that could impact water quality. The sturgeon chub has only a few remaining stable populations throughout its range. The Powder River and Lower Yellowstone is probably the most important drainage left for the sturgeon chub. The Powder River is currently one of the few remaining large alkaline prairie rivers that exhibit an intact native fish and invertebrate fauna. A small change in salinity, temperature, turbidity, radioactive or toxic constituents could render extant the current population of sturgeon chub and negatively impact pallid sturgeon. American Rivers, a national river watchdog group, on 11 April 2001, ranked the Powder River as one of the Nation's top five most threatened rivers in an annual tally of endangered rivers.

If you have any questions regarding this letter, please contact Lou Hanebury of my staff at (406) 247-7367. We appreciate your efforts to consider endangered species in your project planning.

Sincerely,

R. Mark Wilson
Field Supervisor
Montana Field Office

Attachment: *Coal Bed Methane Gas Development in Montana, Some Biological Issues.*

LRH/lrh

cc: Suboffice Coordinator, Ecological Services, Billings, MT.
Field Supervisor, Ecological Services, Wyoming Field Office, Cheyenne, Wyo.

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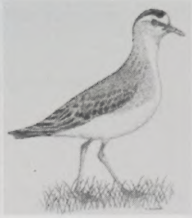


# APPENDIX I

## MOUNTAIN PLOVER SURVEY GUIDELINES

U.S. Fish and Wildlife Service
1999

The mountain plover (*Charadrius montanus*) is a small bird (17.5 cm, 7 in.) about the size of a killdeer (*C. vociferus*). It is light brown above with a lighter colored breast, but lacks the contrasting dark breast-belt common to many other plovers. During the breeding season it has a white forehead and a dark line between the beak and eye, which contrasts with the dark crown.

Mountain plover breeding habitat is known to include short-grass prairie and shrub-steppe landscapes; dryland, cultivated farms; and prairie dog towns. Plovers usually nest on sites where vegetation is sparse or absent, due to disturbance by herbivores, including domestic livestock and prairie dogs. Vegetation at shortgrass prairie sites is less than 4 inches tall, while shrubs visually predominate nest sites within the shrub-steppe landscape. Usually, nest sites within the shrub-steppe are on active prairie dog towns. Nests are commonly located near a manure pile or rock. In addition to disturbance by prairie dogs or livestock, they have also been found on oil drill pads. Mountain plovers are rarely found near water. They may be found on heavily grazed pastures throughout their breeding range and may selectively nest in or near prairie dog towns. Positive indicators for mountain plovers therefore include level terrain, prairie dogs, bare ground, *Opuntia* pads, cattle, widely spaced plants, and horned larks. It would be unusual to find mountain plovers on sites characterized by irregular or rolling terrain; dense, matted vegetation; grass taller than 4 inches, wet soils, or the presence of killdeer.

These guidelines were developed by Service biologists Pat Deibert, Lou Hanebury, and Bob Leachman, and Dr. Fritz Knopf, USGS-BRD. Keep in mind these are guidelines - please call Bob Leachman at 970-243-2778 if you have any suggestions.

## GENERAL GUIDELINES FOR SURVEYS

On February 16, 1999, the Service proposed the mountain plover for federal listing as threatened. Because listing of this species is proposed, the Service may recommend surveys for mountain plovers to better define nesting areas, and minimize potential negative impacts. The Service recommends surveys for mountain plovers in all suitable habitat, as well as avoidance of nesting areas, to minimize impact to plovers in a site planned for development. While the Service believes that plover surveys, avoidance of nesting and brood rearing areas, and timing restrictions (avoidance of important areas during nesting) will lessen the chance of direct impacts to and mortality of individual mountain plovers in the area, these restrictions do nothing to mitigate indirect effects, including changes in habitat suitability and habitat loss. Surveys are, however, a necessary starting point. The Service has developed the following 2 survey guidelines, depending on whether the intent is to determine the presence or absence of plovers at a site during the nesting season, or to determine the density of nesting plovers.

### Survey Protocol

Two types of surveys may be conducted: 1) surveys to determine the presence/absence of breeding plovers (i.e., displaying males and foraging adults), or 2) surveys to determine nest density. The survey type chosen for a project and the extent of the survey area (i.e., beyond the edge of the construction or operational ROW) will depend on the type of project activity being analyzed (e.g., construction, operation) and the users intent. One methodology outlines a breeding survey that was used in northeastern Colorado to establish the density of occupied territories, based on displaying male plovers or foraging adults. The other was developed to only determine whether plovers occupy an area.

### Techniques Common to Each Survey Method

- Conduct surveys during early courtship and territorial establishment. Throughout the breeding range, this period extends from approximately mid-April through early July. However, the specific breeding period depends on latitude, elevation, and weather.

- Conduct surveys between local sunrise and 1000 and from 1730 to sunset (periods of horizontal light to facilitate spotting the white breast of the adult plovers).

- Drive transects within the project area to minimize early flushing. Flushing distances for mountain plovers may be within 3 meters for vehicles, but plovers often flush at 50 to 100 meters when approached by humans on foot.

- Use of a 4-wheel drive vehicle is preferable; however, fallow agricultural fields present an access problem. Use of ATVs has proven highly successful in observing and recording displaying males.

- Stay in or close to the vehicle when scanning. Use binoculars to scan and spotting scopes to confirm sightings. Do not use scopes to scan.

- Do not conduct surveys in poor weather (i.e., high wind, precipitation, etc.).

- Surveys conducted during the courtship period should focus on identifying displaying or calling males, which would signify breeding territories.

- For all breeding birds observed, conduct additional surveys immediately prior to construction activities to search for active nest sites.

- If an active nest is located, an appropriate buffer area should be established to prevent direct loss of the nest or indirect impacts from human-related disturbance. The appropriate buffer distance will vary, depending on topography, type of activity proposed, and duration of disturbance. For disturbances including pedestrian foot traffic and continual equipment operations, a 200-meter buffer is recommended.

## SURVEY TO DETERMINE PRESENCE/ABSENCE

Conduct the survey between May 1 and June 15, throughout the breeding range.

Visual observation of the area should be made within 200 m of the proposed action to detect the presence of plovers. All plovers located should be observed long enough to determine if a nest is present. These observations should be made from within a stationary vehicle, as plovers do not appear to be wary of vehicles.

If no visual observations are made from vehicles, the area should be surveyed on ATV's. Extreme care should be exercised in locating plovers due to their highly secretive and quiet nature. Surveys by foot are not recommended because plovers tend to flush at greater distances when approached using this method. Finding nests during foot surveys is more difficult because of the greater flushing distance.

A site must be surveyed 3 times during the survey window, with each survey separated by at least 14 days.

Initiation of the project should occur as near to completion of the survey as possible. For example, seismic exploration should begin with 2 days of survey completion. A 14 day period may be appropriate for other projects.

If an active nest is found in the survey area, the planned activity should be delayed 37 days, or one week post-hatching. If a brood of flightless chicks is observed, activities should be delayed at least seven days.

## SURVEY TO DETERMINE DENSITY OF NESTING MOUNTAIN PLOVERS

We are assuming people will have received training on point counts in general before using this specialized point count technique adapted to mountain plovers.

### Establishing Transects

Identify appropriate habitat and habitat of interest within geographic areas of interest.

Upon arriving in appropriate habitat, drive to a previously determined random starting point.

For subsequent points, drive a previously determined random distance of 0.3, 0.4 or 0.5 miles.

Each transect of point counts should contain a minimum of 20 points.

### Conducting The Point Counts

1. Conduct counts between last week in June to July 4th at eastern plains elevation in Colorado.
2. Only 1 counter is used. Do not use a counter and recorder or other combinations of field help. Drivers are okay as long as they don't help spot plovers.
3. If an adult mountain plover is observed, plot occupied territories on a minimum of 1:24,000 scale map and on a ROW diagram or site grid (see attached). The ROW diagram will be at a greater level of detail, depicting the location of breeding birds (and possible nest sites) relative to ROW centerline, construction boundary, and applicable access roads.
4. Estimate or measure distances (in meters) to all mountain plovers. Method used should be noted, e.g., estimates w/distance training, estimates w/o distance training, rangefinder or measured with tape measure, etc.
5. Record "fly-overs" as "FO" in the distance column of the data sheet.
6. If you disturb a mountain plover while approaching the point, estimate the distance from point-center to the spot from which the bird was flushed.
7. Conduct counts for 5 minutes with a 3-minute sub sample to standardize with BBS.
8. Stay close to your vehicle while scanning.

**Recording Data**

Record the following information AT EVERY POINT, EVERY DAY.

- start time
- unique point code (don't duplicate within a field crew or across dates)
- number of mountain plovers and distance to each
- land use and/or habitat type (e.g., fallow wheat, plowed, shortgrass)
- temperature, Beaufort wind, and sky conditions (clear, partly cloudy, overcast)
- Information on the data sheet somewhere.
- your name and address
- date
- Record for each point at some point during the census.
- detailed location description of each point count including road number, distance to important intersections.
- record transect and point locations on USGS county maps.
- Universal Transverse Mercator from maps or GPS are useful.

## GENERAL HABITAT INDICATORS

**Positive habitat images**

Stock tank (non-leaking, leaking tanks often attract killdeer)

Flat (level or "tilted) terrain

Burned field/prairie/pasture

Bare ground (minimum of 30 percent)

"Spaced" grass plants

Prairie dog colonies

Horned larks

Cattle

Heavily grazed pastures

*Opuntia* pads visible

**Negative habitat images**

Killdeer present (indicating less than optimal habitat)

Hillsides or steep slope

Prominent, obvious low ridge

Leaky stock tanks

Vegetation greater than 4 inches in height

Increasing presence of tall shrubs

Matted grass (i.e., minimal bare ground)

Lark buntings

**** SURNAME SLIP ****

FOR CORRESPONDENCE REQUIRING
FIELD SUPERVISOR SIGNATURE

AUTHOR: Lou Hanebury
FILE #: blmcbmdeis.wpd (Informal)

REVIEWER(S):

____________________

ASST. FIELD SUPERVISOR: ___________

SPECIAL INSTRUCTIONS: Rob/Mark/Anne

________________

Anne: please review as to wolf and Grizzly special considerations?

Please print and add as addendum regelestark.doc as an attachment to this letter (**print out as a Work document**)__________________

__________________________________

COPIES: ___________________________

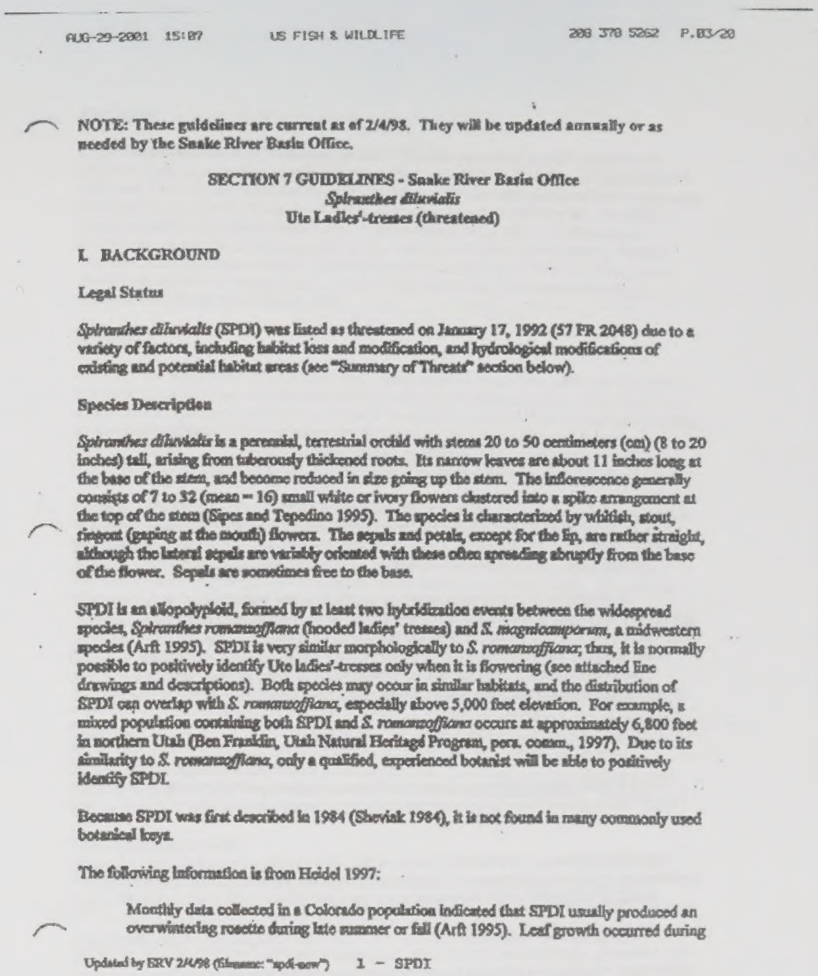
__________________________________

__________________________________

[Attach this slip to Field Office file copy]

Appendix B

# USFWS Survey Guidelines for Ute Ladies' Tresses



**NOTE: These guidelines are current as of 2/4/98. They will be updated annually or as needed by the Snake River Basin Office.**

## SECTION 7 GUIDELINES - Snake River Basin Office
## *Spiranthes diluvialis*
## Ute Ladies'-tresses (threatened)

### I. BACKGROUND

**Legal Status**

*Spiranthes diluvialis* (SPDI) was listed as threatened on January 17, 1992 (57 FR 2048) due to a variety of factors, including habitat loss and modification, and hydrological modifications of existing and potential habitat areas (see "Summary of Threats" section below).

**Species Description**

*Spiranthes diluvialis* is a perennial, terrestrial orchid with stems 20 to 50 centimeters (cm) (8 to 20 inches) tall, arising from tuberously thickened roots. Its narrow leaves are about 11 inches long at the base of the stem, and become reduced in size going up the stem. The inflorescence generally consists of 7 to 32 (mean = 16) small white or ivory flowers clustered into a spike arrangement at the top of the stem (Sipes and Tepedino 1995). The species is characterized by whitish, stout, ringent (gaping at the mouth) flowers. The sepals and petals, except for the lip, are rather straight, although the lateral sepals are variably oriented with these often spreading abruptly from the base of the flower. Sepals are sometimes free to the base.

SPDI is an allopolyploid, formed by at least two hybridization events between the widespread species, *Spiranthes romanzoffiana* (hooded ladies' tresses) and *S. magnicamporum*, a midwestern species (Arft 1995). SPDI is very similar morphologically to *S. romanzoffiana*; thus, it is normally possible to positively identify Ute ladies'-tresses only when it is flowering (see attached line drawings and descriptions). Both species may occur in similar habitats, and the distribution of SPDI can overlap with *S. romanzoffiana*, especially above 5,000 feet elevation. For example, a mixed population containing both SPDI and *S. romanzoffiana* occurs at approximately 6,800 feet in northern Utah (Ben Franklin, Utah Natural Heritage Program, pers. comm., 1997). Due to its similarity to *S. romanzoffiana*, only a qualified, experienced botanist will be able to positively identify SPDI.

Because SPDI was first described in 1984 (Sheviak 1984), it is not found in many commonly used botanical keys.

The following information is from Heidel 1997:

> Monthly data collected in a Colorado population indicated that SPDI usually produced an overwintering rosette during late summer or fall (Arft 1995). Leaf growth occurred during

> the growing season following rosette formation. Inflorescense buds were produced as early as June, followed by flowers from mid-July to mid-August (at least two weeks earlier than in Montana). Fruits matured and dehisced from mid-August into September... Mature plants may remain dormant for at least one growing season without producing any above-ground shoot, but the vegetative shoot condition was much more common than the dormant condition for populations monitored in Utah and Colorado (Arft 1995). Studies of *Spiranthes magnicamporum* in western Kansas and Nebraska report that the incidence of orchid flowering may be as infrequent as once in 20 years (Magrath 1973 in USFWS 1995a).

It is not uncommon for orchids to exhibit prolonged dormancy. Orchid seeds generally require specific symbiotic associations with mycorrhizal fungi for germination. Many *Spiranthes* species persist underground for several years before leaves emerge above ground. In addition, some species of *Spiranthes* do not consistently flower in consecutive years, and may persist underground due to their relationship with mycorrhizal fungi (USFWS 1995a).

The tendency for prolonged dormancy in orchids should be considered in survey and monitoring efforts. According to Lesica and Steele (1994), "when dealing with plants that have prolonged dormancy, it will be necessary to conduct a study for seven years to obtain five years of accurate data. Populations of orchids and species occurring in drought- or flood-prone habitats may have larger proportions of dormant plants or longer dormant periods."

In Idaho, SPDI generally blooms from early August through mid-September, depending on microsite and climatic conditions. At various sites throughout its range, this species may begin blooming in early July or flower as late as early October.

SPDI populations can have a staggered flowering pattern, i.e., some plants may be in fruit while others are still in bud stage. This staggered phenology may be adaptive, or reflect unique microsite conditions for individual plants (Heidel 1997).

### Population Size/Location

SPDI is currently known from Colorado, Idaho, Montana, Nebraska, Utah, Washington, and Wyoming. The total population for this species is approximately 25,000 to 30,000 individuals. Historically, the species was known from Colorado, Utah, and Nevada, although it is thought to be extirpated from Nevada.

In Idaho, approximately 1,170 SPDI plants are known from a total of 20 occurrences in eastern Idaho, along the South Fork of the Snake River between Swan Valley and the confluence with the Henry's Fork (Moseley 1997; Figure 1). These occurrences range in size from one plant to a few hundred individuals. Most of the Idaho sites are very small (less than one acre in size, based on the amount of occupied habitat), although additional potentially suitable habitat exists along the South Fork of the Snake River and elsewhere in the state.

In addition to eastern Idaho, SPDI is found near the base of the eastern slope of the Rocky Mountains in southeastern and central Wyoming and north-central Colorado, and in southwestern Montana; in western Nebraska (adjacent to Wyoming); in the upper Colorado River basin, particularly the Uinta basin; and along the Wasatch Front and westward in the eastern Great Basin, in north-central and western Utah. One SPDI population has recently been located in north-central Washington, in Okanogan County. Habitat characteristics for the known occurrences of SPDI are briefly summarized below.

### Habitat

SPDI is endemic to mesic or wet meadows and riparian/wetland habitats near springs, seeps, lakes, or perennial streams. Soils may be inundated early in the growing season, normally becoming drier but retaining subsurface moisture through the season. (However, particularly in drought years, subsurface moisture may not be present within 12 inches below the soil surface.) Elevations of known orchid occurrences range from approximately 1,500 to 7,000 feet (ft).

Generally, this species occurs in areas where the vegetation is relatively open (e.g., grass and forb-dominated sites), but some populations are found in riparian woodlands (such as cottonwoods) in Colorado, Utah, and Idaho and in riparian shrub (e.g., willow thickets) communities. Soils range from fine silt/sand to gravel and cobbles, sometimes highly organic or peaty soils. In some areas, the wetland habitats and soils that support this species are moderately to strongly alkaline.

SPDI may survive in areas where streams remain in a somewhat natural condition, or where conditions mimic naturally created and maintained habitat. For example, it may be found along old gravel pits that have been restored as wetlands, in irrigated pastures, or below leaky diversion dams and irrigation canals.

Habitat characteristics for SPDI sites in the various states are briefly summarized below. (This information is incomplete, and is subject to change; if you need additional information, please contact the respective state heritage programs).

Colorado:

In Colorado, SPDI occurs in mesic riparian meadows, irrigated pastures, and riparian woodland understory habitats, located primarily on private, state, and city (i.e., Boulder open space) property. At some of the wet meadow sites in Colorado, SPDI has been found in fairly dense vegetation with meadow grasses 2 to 3 feet tall and a litter layer from 1 to 4 inches in depth. The effects of grazing and mowing on SPDI in an irrigated pasture site were described by Arft (1995); this information is summarized in the "Summary of Threats" section in these guidelines.

Associated species include: *Agalinis tenuifolia, Agrostis stolonifera, Asclepias incarnata, Calamagrostis* spp., *Carex nebraskensis, Cirsium arvense, Equisetum* spp., *Juncus balticus, J. dudleyi, J. longistylis, J. nodosus, Lobelia siphilitica, Sisyrinchium* spp., *Solidago* spp., *Triglochin* spp., and *Verbena hastata* (USFWS 1995).

### Montana:

SPDI was first discovered in Montana in 1994. It is restricted to wet meadows fed by stable groundwater, along meandered wetlands, and in seeps in alkaline valley bottoms (Heidel 1997). One of the five Montana sites is present in a localized seep along a valley margin. The known sites range from 4,350 to 4,800 feet in elevation. Total occupied habitat is less than 9 acres; land ownership is primarily private, although one site is located on state land (Heidel 1997). Associated species include: *Eleocharis pauciflora*, *Muhlenbergia richardsonii*, *Carex simulata*, *C. praegracilis*, *Glaux maritima*, *Juncus balticus*, *J. longistylis*, and *J. nodosus*.

### Nebraska:

SPDI was discovered in Nebraska in 1996. It is located just east of the Wyoming border, adjacent to one of the SPDI sites in Wyoming. The local dominant species is *Juncus balticus*; other common species include *Eleocharis pauciflora*, *Agrostis stolonifera*, *Hordeum jubatum*, *Triglochin maritima*, and *Melilotus alba* (Hazlett 1996, as cited in Heidel 1997).

### Idaho:

SPDI was first discovered in Idaho in 1996 along the South Fork of the Snake River in eastern Idaho. All known occurrences of SPDI in Idaho to date are found along the South Fork of the Snake River, generally from Palisades Dam downstream to the confluence with the Henry's Fork (Figure 1). Along the South Fork, SPDI occurs in a variety of areas including swales, mesic meadows, cottonwood stands, and islands. These areas contain at least some component of grass and/or forb-dominated habitat. However, SPDI plants can be surrounded by, or located in close proximity to, shrubs or trees such as willows, silverberry, or cottonwoods. Associated species may include: *Agrostis stolonifera* (bentgrass), *Carex lanuginosa* (woolly sedge), *Eleocharis rostellata* (beaked spikerush), *Eleagnus commutata* (silverberry), *Habenaria dilatata* (bog orchid), *Juncus balticus* (Baltic rush), *Equisetum* spp. (horsetails), *Salix exigua* (sandbar willow), *S. lutea* (yellow willow), and narrowleaf cottonwood (*Populus angustifolia*) (Moseley 1997a, 1997b).

### Utah:

In Utah, SPDI populations are found in a variety of habitats, including: riparian, spring, and lakeside wet or mesic meadows, in addition to understory wetland meadows of riparian woodlands and small openings in riparian shrub communities. Some sites occur along small tributaries; one site was found in wetlands that developed within an abandoned gravel pit administered by the Bureau of Reclamation. Ownership includes private, tribal, BLM, Forest Service, and National Park Service lands.

Associated species include: *Agrostis stolonifera*, *Alnus incana*, *Aster hesperius*, *Calamagrostis* spp., *Carex* spp., *Castilleja exilis*, *Cirsium arvense*, *Dactylis glomerata*, *Epipactis gigantea*, *Equisetum laevigatum*, *Juncus* spp., *Melilotus* spp., *Oenothera elata*, *Populus angustifolia*, *Prunella vulgaris*, *Salix* spp., *Solidago occidentalis*, and *Trifolium pratense* (USFWS 1995).

### Washington:

SPDI was first discovered in Washington in 1997. The site consists of a single population in Okanogan County, located on private land along the shore of Wannacut Lake. At approximately 1,800 feet, it is the lowest elevation recorded for SPDI. This discovery extended the known range of this species considerably to the north and west of other occupied habitat areas. The site is located in periodically flooded alkaline flats along Wannacut Lake, adjacent to Ponderosa pine/Douglas fir woodlands and sagebrush steppe habitat (with *Artemisia tridentata*, *Purshia tridentata*, and *Chrysothamnus* sp.). Associated species include: *Eleocharis rostellata*, *Carex viridula* var. *viridula*, *C. lanuginosa*, *C. parryana* var. *parryana*, *Panicum occidentale*, *P. capillare*, and *Juncus torreyi* (Bjork 1997).

### Wyoming:

SPDI was first discovered in Wyoming in 1993. Sites range from 4,700 to 5,500 feet in elevation, and occur in moist to wet meadows, and within or adjacent to riparian habitats such as banks and stream bottoms (Hartman and Nelson, undated). Associated species include: *Agrostis stolonifera*, *Aster ericoides/falcatus*, *Carex nebrascensis*, *Elymus canadensis*, *Equisetum laevigatum*, *Helianthus nuttallii*, *Juncus balticus*, *J. nodosus*, *J. longistylis*, *Medicago lupulina*, *Melilotus albus*, *Muhlenbergia asperifolia*, *Plantanthera dilatata*, *Sisyrinchium* sp., and *Spartina gracilis*.

At one site, SPDI plants were found on a 45 degree slope between cattails and a dry, sandy bench. In Goshen County, SPDI occurs in two main habitats: 1) alkaline meadows fed by springs, and 2) on an alluvial terrace adjacent to a creek. In Converse County, the SPDI population occurs in habitat characterized as: "open creek bank in zone between dry grassland community at top of bank and cattail marsh lining stream channel on moist, coarse, non-alkaline sands. Absent from steep banks between channel and prairie" (Wyoming Natural Diversity Database 1997).

## Summary of Threats

The riparian and wetland habitats that support this species have been heavily impacted by urban development, stream channelization, water diversions and other watershed and stream alterations that degrade natural stream stability and diversity. Conversion of riparian/ floodplain land to agricultural uses has destroyed habitat for SPDI in many areas. Many SPDI populations are located on private land, and have no long-term protection. In addition, because SPDI occurs in small, scattered groups, it is vulnerable to natural and human-caused disturbances. The effects of grazing, recreation, and other factors are discussed below.

### Grazing.

Sexual reproduction is critical to the life cycle of SPDI. To reproduce, SPDI must be able to produce flowers, fruits, and seeds. Plants that are damaged or destroyed before seed set by factors such as grazing, trampling, etc. are not able to reproduce successfully. Livestock grazing can impact SPDI directly by trampling and/or consumption of SPDI plants. In addition, grazing can impact SPDI indirectly by soil compaction, channel incision that leads to lowered water tables, and increased rodent herbivory (e.g., in exclosures).

From 1992 to 1994, Dr. Anna Arft conducted a 3-year demographic study of SPDI in Utah and Colorado (Arft 1995). Four SPDI sites were studied, including 1 agricultural haymeadow (= Ag site) and 3 nonagricultural riparian sites. Fruit set (i.e., the successful production of fruits and seeds) was found to be the single most important biological factor influencing the persistence of SPDI. Failure to produce fruit was due to external environmental factors such as mowing, herbivory, off-road vehicle use, and trampling (Arft 1995).

Dr. Arft compared the effects of management techniques on SPDI at the Ag site, including winter grazing, summer mowing, and burning. Compared to the SPDI riparian sites, all of the management techniques at the Ag site (including grazing) resulted in lower fruit set. The SPDI population at the Ag site was found to be stable or declining, whereas the riparian SPDI populations were "healthy and growing" (Arft 1995).

The SPDI population at the Ag site, which occurs in a "completely unnatural habitat" influenced by irrigation, grazing, and mowing, "may not be viable without continued human intervention." The Ag site was found to be over 30 times more susceptible to extinction than the riparian sites (Arft 1995). The much higher intrinsic growth rates found at all 3 riparian sites relative to the Ag site reflect the agricultural impacts (i.e., grazing, mowing, and exotic plant invasion) to the Ag site.

Dr. Arft is concerned that her results regarding grazing and SPDI may be misinterpreted (e.g., by assuming that grazing is OK for this species); she also believes that trampling (associated with livestock grazing) in riparian areas could have an adverse impact on SPDI (Arft, University of Colorado, Boulder, pers. comm., 1998).

### Changes in Hydrology

Stream processes have been altered by a variety of activities, including the development of reservoirs, dams, and diversions for urban and/or agricultural uses. It may be difficult to maintain or reinstitute instream flows, especially flows that mimic a natural hydrograph. Compaction, resulting from grazing, construction, and/or recreational activities, can also lead to changes in hydrology. It is possible that in some areas, groundwater withdrawals may negatively affect habitat for this species.

### Recreation

The construction and maintenance of roads, trails, boat ramps, and campgrounds could adversely affect SPDI habitat. Off-road vehicle use can also damage individuals and habitat for SPDI. However, dispersed "minimum impact" recreation activities such as rafting and hiking are not likely to severely degrade habitat for this species.

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### Exotic Species

Exotic plant species can adversely affect habitat for SPDI. For example, species such as purple loosestrife (*Lythrum salicaria*), whitetop (*Cardaria sp.*), Russian olive (*Eleagnus angustifolia*), and reed canarygrass (*Phalaris arundinaceae*) can threaten the reproduction of SPDI. In the Boulder, Colorado area, uncontrolled Canada thistle growth has prevented SPDI from flowering and reproducing.

### Pollinator Impacts

Pollination by bumblebees (considered to be the primary pollinators of SPDI) is essential to this species' sexual reproduction. Management of SPDI should be based on an ecosystem or community approach, and must consider the requirements of pollinators of SPDI. In some areas, a scarcity of pollinators may limit the reproduction of SPDI (Sipes and Tepedino 1995). Pollinators of SPDI (i.e., bumblebees and other native bees) may depend on associated plant species for pollen and/or nectar sources, and may utilize various physical and/or biological habitat features for nesting. For example, bees may nest in the ground, or in downed or standing trees and logs. Trampling impacts from grazing could impact ground-nesting bees (Sugden 1985).

Maintaining floral diversity in SPDI habitat is critical. Pollinators of SPDI must collect pollen from other flowering species; if no pollen source is located nearby, it is unlikely that bumblebees would visit SPDI (Sipes and Tepedino 1995). Since bumblebees forage from early spring until late autumn, species flowering before SPDI are important for attracting and maintaining bumblebee colonies in the area (Sipes and Tepedino 1995).

### Herbicide and Pesticide Use

Herbicides and pesticides may negatively impact this species, either directly or indirectly (e.g., via drift). Herbicides and pesticides may be used by Federal agency staff (and other parties) in areas including campgrounds, agricultural sites, and roads. SPDI habitat could be present in or adjacent to such areas.

Pesticide spraying can negatively affect pollinators of SPDI. The activity period of bumblebees (the primary pollinators of SPDI) makes them vulnerable to insecticide spraying from spring to early autumn (Sipes and Tepedino 1995).

### Habitat Conversion

Many wetland areas throughout the range of SPDI have been converted to agriculture or urban/suburban development. In addition, the use of heavy equipment associated with agricultural or other activities (including construction and road or facility maintenance) can impact this species directly by destruction of individuals, or indirectly by soil compaction and possible subsequent changes in hydrology.

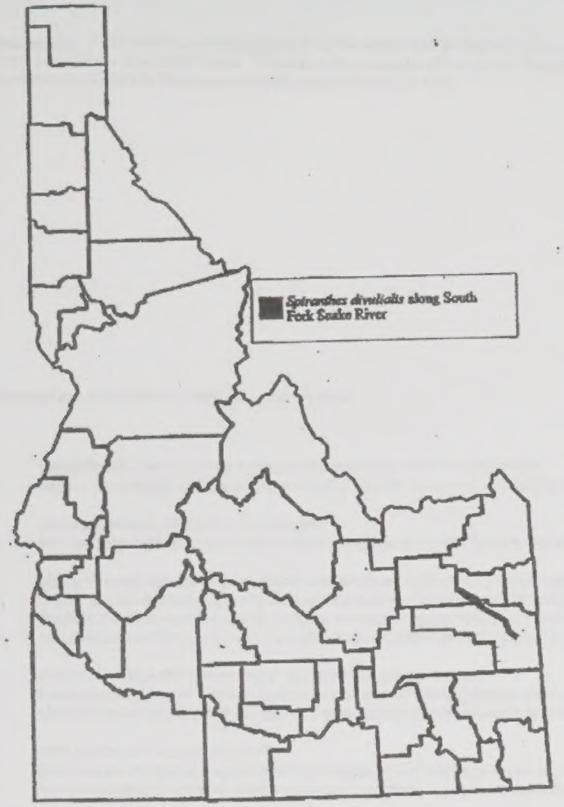

Figure 1 - SPDI. Known distribution of *Spiranthes diluvialis* in Idaho (as of 2/98).

## II. GUIDELINES - Protocol for Evaluating Project Effects

Ensure that any proposed or ongoing actions are consistent with these guidelines and recovery objectives. No ground disturbing activities should be allowed within habitat occupied by this species. Actions that may alter hydrology (including but not limited to stream channelization, mining, or reservoir operation/development) should be reviewed for potential impacts to SPDI. Any activities that involve trampling or soil compaction (such as recreational activities, grazing, and maintenance or construction projects) should also be reviewed. (Refer to the "Summary of Threats" section for more information on activities that may affect this species.)

In general, *Spiranthes diluvialis* should be considered when reviewing projects and activities that may affect riparian or wetland habitats ranging from 1,500 to 7,000 feet. The potential for *S. diluvialis* should be considered when visiting wetlands or streams for any purpose, and when reviewing projects including fishery, wetland, or stream enhancement or alteration projects; hydroelectric projects and Clean Water Act Section 404 permit applications; and when conducting surveys for other species of interest that may be in or near potential orchid habitat. Although *S. diluvialis* is currently known only from the South Fork of the Snake River in Idaho, it is likely that this species will be found in other areas containing suitable habitat.

Grazing: Monitoring and surveys for SPDI should be conducted in occupied and potentially suitable SPDI habitat areas on Federal lands where such habitat may be affected by grazing.

Surveys should be conducted during the flowering season for SPDI (i.e., when it is identifiable) in areas of known and/or potential habitat before grazing by domestic livestock occurs. Surveys conducted during or after grazing occurs are not likely to yield valid results regarding the presence or absence of SPDI. Overgrazing in riparian habitat will adversely affect not only *Spiranthes diluvialis* but the entire community (see "Summary of Threats" section for additional information regarding grazing and SPDI).

Potential Habitat

Given its distribution and the variety of habitats in which SPDI is found, it is not possible to narrowly define potential habitat for this species. Our definition of potential habitat is likely to be further modified as new information on the distribution of SPDI is available. Experience indicates that, although potential habitat may be fairly widespread, actual occurrences of SPDI are rare. However, certain physical and/or biological characteristics can help evaluate whether habitat is not present, or is not suitable for SPDI (see "Disqualified Habitat" section below).

In general, potential habitat may be found from 1,500 to 7,000 feet in areas where suitable hydrology exists, e.g., at isolated springs/seeps, wet meadows, or riparian areas. Soils will likely be moist to the surface or have subsurface moisture throughout the growing season. Some sites may be periodically flooded or inundated. The presence of associated species (see "Habitat" section) is another indicator of potential habitat. Areas that support other orchid species such as *Spiranthes romanzoffiana*, *Habenaria* spp., or *Epipactis gigantea*, should also be evaluated for the presence of SPDI.

Disqualified Habitat (adapted from USFWS 1995b)

- appropriate hydrology not present, typically indicated by: a) area composed of mostly upland vegetation, and/or b) area dries up by mid-July, with water table lower than 12 inches below the surface
- site heavily disturbed, e.g.:
  - stream banks channelized and stabilized by heavy riprap
  - highway rights-of-way built on filled or compacted soil or rock material
  - construction sites where construction has either stripped the topsoil or where construction has been completed within the last 5 years but the area has not been revegetated
  - Note: SPDI has been found in some heavily disturbed sites where hydrology is appropriate, such as revegetated gravel pits, grazed riparian edges and pastures, and along well-traveled trails developed on old berms
- stream banks steep; transition from stream margin to upland areas abrupt
- site characterized by standing water with cattails, bulrushes, and other aquatic vegetation (note that the margins of such areas may be suitable habitat, and SPDI has been found in areas that are temporarily inundated)
- riparian areas or stream banks vegetated by dense rhizomatous species such as reedgrass (*Phalaris arundinacea*), tamarisk (*Tamarix ramosissima*), teasel (*Dipsacus sylvestris*), common reed (*Phragmites australis*), or saltgrass (*Distichlis spicata*)
- riparian areas overgrazed or managed such that the vegetation is composed of upland native or woody species or is unvegetated; in some cases, SPDI may tolerate overgrazing as long as it has not resulted in a drop of the water table or conversion of the community to upland or weedy species (refer to Threats section for more information on grazing)
- potential habitat has been converted to agricultural uses and is now plowed and cropped, or has been converted to lawns or golf courses
- wetland is a brackish playa or pothole not fed by springs, or not in the floodplain of or hydrologically connected with a riparian system or other source of fresh water

Survey Guidelines:

Surveys should be required as part of section 7 consultation in areas identified as high priority for surveys, e.g., within watersheds containing known and/or potential habitat for this species. Surveys should be conducted for projects that could affect large areas of potential habitat. Examples of such projects include: stream channelization and stabilization, stream habitat improvement, projects that impact downstream hydrology such as dams, diversions, hydropower, road/highway construction, gravel mining, and streamside recreation trails.

Surveys should be conducted in watersheds that are adjacent to or essentially similar in character to those where the orchid is currently known to occur. Surveys are recommended when large areas of potential habitat will be impacted and/or when planning schedules permit surveys prior to project commencement. Project proponents should be alerted and encouraged to schedule project planning to allow time for orchid surveys.

Brief Summary of Survey Protocol:

- Surveys should be conducted according to the Rare Plant Inventory Guidelines (attached).
- Surveys should be conducted during the peak flowering period, generally from mid-August through mid-September. Surveys conducted at other times of year are not reliable and should not be accepted.
- Surveys should be conducted by walking or otherwise closely scrutinizing potential habitat looking for flowering stalks, and should be performed by trained botanists familiar with conducting rare plant inventories. Known populations range in size from 1 to ca. 7,000 plants. In addition, because plants may not bloom every year, *S. diluvialis* may not be visible during a "quick" one-time only survey. Several visits during the growing season, and in consecutive years, may be advisable.
- any new sites should be mapped and immediately reported to the Conservation Data Center and FWS (Snake River Basin Office).

Collection: Only designated FWS staff members and "agents of the Service"[1] can collect *S. diluvialis*. Collecting should NOT be encouraged for biologists in other agencies or private individuals. Following is an excerpt from the draft subpermit amendment request:

> No more than three individuals or less than 5 percent of the population, whichever is less, at each site shall be collected. Specimens shall be preserved in accordance with currently accepted protocol and deposited with The Idaho Museum of Natural History, Idaho State University, Pocatello, Idaho.

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[1] "Agents of the Service" may include CDC staff that are under a Section 6 contract with FWS

Species Lists: *S. diluvialis* is currently being included on species lists for Federal agencies throughout Idaho and eastern Oregon. This reflects the expansion of the species' range following the discovery of SPDI in Washington state (Okanogan County) in 1997.

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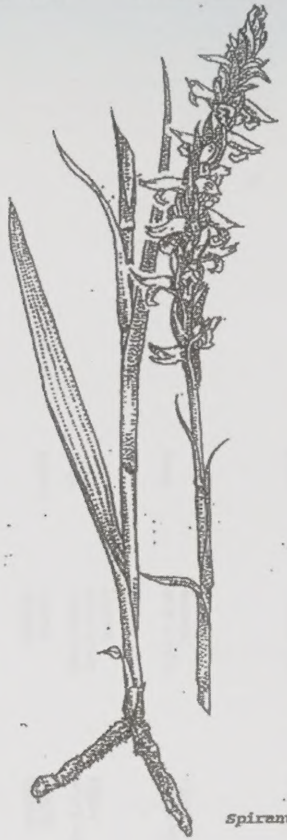
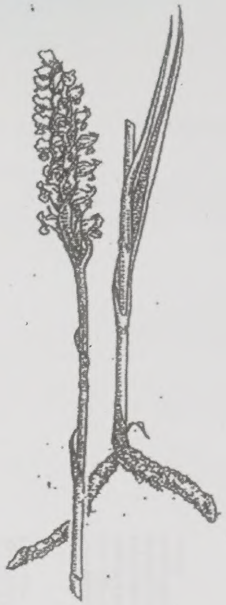
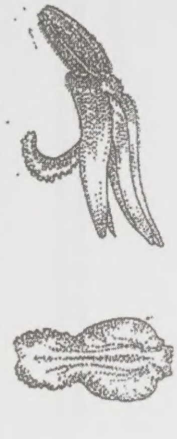


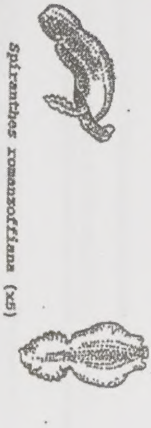
*Spiranthes diluvialis* (x1)



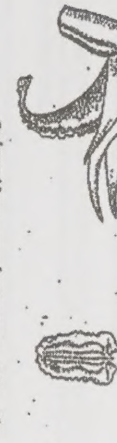
*Spiranthes romanzoffiana* (x1)



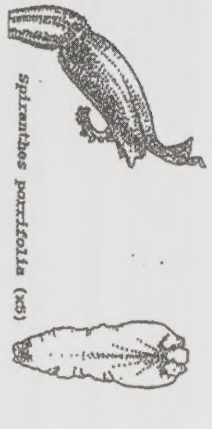
*Spiranthes diluvialis* (x5)



*Spiranthes romanzoffiana* (x5)



*Spiranthes magnicamporum* (x5; lip x2)



*Spiranthes porrifolia* (x5)

Table 1. Comparison of diagnostic features of *Spiranthes diluvialis* with *S. porrifolia*, *S. romanzoffiana*, and *S. magnicamporum*. (Data are from Luer 1975; Sheviak 1984, 1990; U.S. Fish and Wildlife Service 1992a.)

| Character | *Spiranthes diluvialis* | *Spiranthes porrifolia* | *Spiranthes romanzoffiana* | *Spiranthes magnicamporum* |
|---|---|---|---|---|
| Leaves | Several, mostly at base of stem, persistent | As in *S. romanzoffiana* | Often numerous, sometimes extending up the lower stem, persistent | Few, strictly basal, typically withering before anthesis |
| Rachis | As in *S. magnicamporum* | As in *S. romanzoffiana* | Glabrous or sparsely pubescent, the the longest hairs < 0.18 mm long (usually much less), the glands often sessile or subsessile | Sparsely to densely pubescent, the longest hairs ≥ 0.19 mm (often much longer), the glands obviously stalked |
| Flowers | Ascending, rather long and slender, whitish to ivory-colored, ringent (gaping at mouth); lip exposed in lateral view | Ventrally curved, slender, yellowish, open only at the apex (not ringent); lip hidden in lateral view except for the reflexed lip. | Strongly ascending, short, broad at base, white to cream, with a well-developed hood open only at the apex (not ringent); lip hidden in lateral view except for the reflexed tip | Abruptly nodding, long and slender; lip exposed in lateral view for its entire length |
| Sepals | Often connate at base for a short distance, sometimes free; variably appressed, spreading, or ascending; hood rarely evident | Fused for some length and joined with the petals, appressed for most of their length but widely spreading toward the apices | Fused for some length and united with the petals to form a prominent hood above the lip | Free at base, the lateral sepals spreading, often ascending above the rest of the flower |

Table 1 (cont'd). Comparison of diagnostic features of *Spiranthes diluvialis* with *S. porrifolia*, *S. romanzoffiana*, and *S. magnicamporum*.

| Character | *Spiranthes diluvialis* | *Spiranthes porrifolia* | *Spiranthes romanzoffiana* | *Spiranthes magnicamporum* |
|---|---|---|---|---|
| Lip | Ovate to lanceolate or oblong in outline, with a marked median constriction, the base usually dilated; lacking a dense cushion of short hairs on upper surface near apex; membranous when moist; venation mostly parallel, typically with some branching, divaricating veins in lower half; calli often elongated | Ovate to lanceolate in outline, ± acute, the apex only slightly or not at all dilated; with a dense cushion of peg-shaped hairs on upper surface near apex; membranous when moist | Strongly pandurate (violin-shaped with a marked median constriction), the apex dilated; glabrous on upper surface; membranous when moist; prominently veined below the constriction with laterally diverging, branched veins | Ovate to lanceolate in outline, without a marked subapical constriction; thick and fleshy when moist; venation largely parallel, diverging branched veins if present restricted to the very base; calli short, conical |
| Chromosome Number | $2n = 74$ | $2n = 44, 66, 88$ | Commonly $2n = 44$ | $2n = 30$ |
| Flowering Period | Late July through August, in some cases through September | May through early July, rarely into early August at high elevations | May to October | Mid-September into November |
| Geographic Range | Low elevations (mostly below 6,500 feet) in the Colorado River drainage and eastern Great Basin of Utah and (historically) eastern Nevada; disjunct locally along the eastern front of the Rocky Mtns. in Colorado | Widespread in Pacific Northwest, not known from east of the eastern base of the Sierra Nevada in California | Boreal region of North America; high elevations (rarely below 8,500 feet) in Utah and Colorado | Midwestern plains, from Indiana to the Dakotas and south to Texas; disjunct in Ohio, Alabama and Mississippi, and New Mexico |

United States Department of the Interior

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M.02 - BLM Formal (6-MT-2-F010) September 4, 2002

Memorandum

To: Field Manager, Bureau of Land Management, Miles City Field Office, Miles City, Montana,

From: Field Supervisor, U.S. Fish and Wildlife Service, Montana Field Office, Helena, Montana

Subject: Final Biological and Conference Opinions for Coal Bed Methane Production in Blaine, Gallatin, Park, Carter, Powder River, Custer, Rosebud, Treasure, Wheatland, Sweet Grass, Stillwater, Carbon, Golden Valley, Musselshell, Yellowstone, and Big Horn Counties, Montana.

This document transmits the U. S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed changes in the coal bed methane (CBM) development program by the Montana State Office on the Bureau of Land Management (BLM). Proposed changes affect management in parts of 16 counties in Montana including: Blaine, Gallatin, Park, Carter, Powder River, Custer, Rosebud, Treasure, Wheatland, Sweet Grass, Stillwater, Carbon, Golden Valley, Musselshell, Yellowstone, and Big Horn Counties, and its effects on the bald eagle (*Haliaeetus leucocephalus*), and mountain plover (*Charadrius montanus*), in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your April 10, 2002, request for formal consultation was received in the Billings Suboffice on June 10, 2002.

These biological and conference opinions are based on information provided in the January 17, 2002 *Montana Statewide Draft Oil and Gas Environmental Impact Statement (EIS) and Amendment of the Powder River and Billings Resource Management Plans (RMPs)*, the January 24, 2002 Biological Assessment; the April 10, 2002 Revised Biological Assessment; and numerous telephone conversations and meetings regarding coal bed methane development in the general project vicinity. A complete administrative record of this consultation is on file at the Service's Montana Field Office, Billings Suboffice, Billings, Montana.

We concur with your determinations that the proposed action is likely to adversely affect the threatened bald eagle, and the proposed mountain plover. Although the BLM has determined that implementation of proposed changes in coal bed methane is likely to affect the black-tailed prairie dog *(Cynomys ludovicianus)*, we concur with your determination that the action is not likely to adversely affect the black-footed ferret (*Mustela nigripes*). This concurrence is based upon the BLM's commitments to 1) locate project activity to avoid impacts to prairie dog colonies that meet FWS criteria as black-footed ferret habitat (U.S. Fish and Wildlife Service 1989), 2) conduct ferret surveys in suitable habitat, following current lease stipulations for oil and gas development, and 3) if a black-footed ferret or its sign is found during a survey, all development activity would be subject to recommendations from the *Montana Black-footed Ferret Survey Guidelines, Draft Managing Oil and Gas Activities in Prairie Dog Ecosystems with Potential for Black-footed ferret Reintroduction* and re-initiation of Section 7 Consultation with the Service.

The Service also concurs with your determination that the action is not likely to adversely affect the threatened Ute ladies'-tresses orchid (*Spiranthes diluvialis*), the pallid sturgeon *(Scaphirhynchus albus)*, and the Montana arctic grayling *(Thymallus arcticus)*. The Service gives its concurrence to BLM's determination of "no effect" for the Canada lynx *(Lynx canadensis)*, gray wolf *(Canis lupus)*, interior least tern *(Sterna antillarum athalassos)*, and the warm spring zaitzevian riffle beetle *(Zaitzevia thermae)*.

## Consultation History

The Billings Suboffice received a *Interested Party letter, News Release, a Notice of Intent to Plan,* and *Draft Planning Criteria* from the BLM and Montana Department of Environmental Quality (MTDEQ) on December 19, 2000. Informal consultation on this project began with the Service's receipt of the BLM's 28 February 2001 letter describing the development of a joint Draft Environmental Impact Statement with the Montana Department of Natural Resources and Conservation addressing oil, conventional and coal bed methane development. On April 20, 2001, the Service provided an updated species list for the 16 counties in Montana that may experience coal bed methane development, as well as, our initial concerns on impacts to trust resources. The Draft Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans was received in the Billings Suboffice on February 21, 2002. The Montana Field Office responded with comments on the DEIS on May 15, 2002. Informal discussions on the BLM's effects determination on listed species in a separate *Biological Assessment For Coal Bed Methane Production in Montana* dated January 24, 2002 and concerns for adverse impacts to the bald eagle and mountain plover, resulted in the issuance of a revised biological assessment. The revised *Biological Assessment For Coal Bed Methane Production in Montana* and a letter requesting initiation of formal consultation for the bald eagle and formal conferencing for the mountain plover was received by the Montana Field Office on April 11, 2002.

Over the last two years, the Service has attended meetings and forums to discuss issues on CBM with federal and state agencies, oil and gas industry, private conservation groups, land owners and private individuals. We are a member of the Montana Interagency Coal-Bed Methane (ICBM) Technical Group. We have also worked closely with the BLM and industry in a smaller BLM working group, to minimize impacts of CBM on trust resources by developing stipulations, guidelines and monitoring protocols.

## BIOLOGICAL AND CONFERENCE OPINIONS

### DESCRIPTION OF PROPOSED ACTION

The Bureau of Land Management (BLM), Miles City and Billings District Offices, Montana, are proposing changes in the coal bed methane development program. The Powder River and Billings RMPs, as amended by BLM's 1994 *Oil and Gas Amendment of the Billings, Powder River, and South Dakota Resource Management Plans* (RMPs), support conventional oil and gas development and limited CBM exploration and development. The BLM proposes to amend the Billings and Powder River RMPs to address increased interest in CBM in these districts. An Environmental Impact Statement (EIS) is being prepared to evaluate impacts arising from implementation of the amended RMPs. The State of Montana (state) has joined with the BLM as a co-lead agency in preparation of the EIS to address similar increased interest in CBM on state lands, emphasizing Park, Blaine, and Gallatin counties.

The project is located across south-central and southwestern Montana with additional project areas in Gallatin and Park County in southwestern Montana and in Blaine County in north-central Montana. This area includes parts of sixteen counties: Blaine, Gallatin, Park, Carter, Powder River, Custer, Rosebud, Treasure, Wheatland, Sweet Grass, Stillwater, Carbon, Golden Valley, Musselshell, Yellowstone, and Big Horn.

The planning area shown is defined as the area where oil and gas decisions will be made by BLM or the State of Montana. The BLM's planning area is the oil and gas estate administered by the BLM in the Powder River and Billings RMP areas. The State of Montana's planning area is statewide, with emphasis on the state-administered oil and gas within the BLM planning area and in Blaine, Park and Gallatin counties. The planning area excludes those lands administered by the Forest Service, the Crow Tribe, Northern Cheyenne Tribe, and other Indian lands. The Billings and Powder River RMP areas, and Blaine, Park, and Gallatin counties, are referred to in the document as the BLM and State CBM emphasis area. This is the 16-county area within the BLM and state planning area where there is CBM development interest. The Powder River RMP area encompasses the southeastern corner of Montana, including Powder River, Carter, and Treasure counties, and portions of Big Horn, Custer, and Rosebud counties. The Powder River RMP area comprises approximately 1,080,675 acres of federally managed surface and 4,103,700 acres of federal mineral estate.

The Billings RMP area comprises the south-central portion of Montana consisting of Carbon, Golden Valley, Musselshell, Stillwater, Sweet Grass, Wheatland, and Yellowstone counties and the remaining portion of Big Horn County. The Billings RMP area comprises approximately 425,336 acres of federally managed surface and 906,084 acres of federal mineral estate. Adjacent to the planning areas, other major land holdings include the Crow, Northern Cheyenne, and Fort Belknap Indian Reservations, the Custer National Forest, portions of Yellowstone National Park, the Big Horn Canyon National Recreational Area, the Burlington Northern and Santa Fe Railroad, and the Fort Keogh Agricultural Experiment Station. The total surface area of the CBM emphasis area (all owners) exceeds 25 million acres. The total planning area to which the conservation measures and non-discretionary Terms and Conditions of this biological opinion will be implemented by the BLM equals 5,009,784 acres.

The oil and gas industry predicts growing interest in the exploration and development of CBM because of efforts to find alternative energy sources. Increased CBM development would result in a major federal action with potential to significantly affect the environment.

Exploration and development of CBM resources on BLM, state, or fee minerals are allowed subject to agency decisions, lease stipulations, permit requirements, and surface owner agreements. Under the Preferred Alternative, operators would be required to submit a Project Plan outlining the proposed development of an area when requesting CBM well densities greater than 1 well per 640 acres. The Project Plan would be developed in consultation with the affected surface owner(s) and other involved permitting agencies. All shallow coal seams would have vertical wells installed; for deeper coal seams, the operator would drill directionally or demonstrate in the project plan for agency consideration why directional drilling is not needed or feasible. Operators would develop single or multiple coal seams per their plans, however, there would be only one well bore per coal seam per location per designated spacing restriction. Operators would also be required to demonstrate in their project plan how impacts to surface resources, such as wildlife, would be minimized or mitigated. General Assumptions given in the Statewide DEIS state that the spacing for CBM wells would be similar to CBM well spacing in Wyoming with one location per 80 acres per coal seam. Up to three coal seams have been identified for possible methane extraction in the Powder River Basin. As stated in the DEIS, this would result in three wells drilled at each location per 80 acre spacing unit.

This Biological Opinion is based on the effects presented in the Revised Biological Assessment based on 80-acre location (pad) spacing, with up to 3 wells per location. Therefore, 8 locations per section could result in 24 wells (well bores) drilled in each section (per square mile). Should a denser spacing of wells be planned or occur due to additional wells per seam, location, or per designated spacing restriction, reinitiation of consultation will be required.

Each well project has four phases: exploration, development, operation, and shutdown. Once a well is in place, it is expected to operate for 20 years before abandonment. The BA focused on the first two phases, exploration and development. These lead to the operation phase, once the well is in place.

During exploration, 4.14 acres are likely to be disturbed for each well for exploration, construction, and drilling operations. Based on 18,300 wells (well bores), BLM estimates that 75, 762 acres will be directly disturbed, 9,018 miles of new CBM roads constructed with 27, 917 miles of new utility line corridors (power lines). When exploratory construction begins on a site, the exploratory well will take about 3 to 5 days to drill, with 2 to 3 extra days to complete for CBM if the site is developed. During the exploratory phase, wildlife species will be disturbed by the presence of bulldozers, drilling equipment, and other machinery. The short-term disturbance effect of the exploratory phase will end with either abandonment or continuation to the development stage, if the well site is suitable for production. If the site is abandoned after exploration, the site will take approximately 5 years to attain preconstruction vegetative canopy cover values. Reclamation of the site with vegetation will be undertaken, but restoration to pre-project conditions is not planned. Development disturbance will begin if exploration results in estimates of suitable levels of production. This and operational disturbance should be considered long-term because of the permanent placement of the pad. The materials source for roads would be located as close as possible to each project site, but no specific sources have been identified at this time.

**Conservation Measures**

The BLM has addressed some of the direct and indirect impacts of the project to listed and proposed species, as well as the habitats for these species by incorporating conservation measures into the proposed project as presented in the Revised Biological Assessment. The BLM significantly addresses other direct and indirect impacts through the implementation of a *Coal Bed Methane Programmatic Wildlife Monitoring and Protection Plan for the Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans* (Wildlife Monitoring Protection Plan).

Project Plans will be developed and approved using the programmatic guidance outlined in the Wildlife Monitoring Protection Plan. They will include baseline inventory in areas where wildlife inventory has not been completed. Operators will be required to submit plans that demonstrate how their project design minimizes or mitigates impacts to surface resources and meets objectives for wildlife. The Wildlife Monitoring and Protection Plan is a cooperative approach that incorporates adaptive environmental management principles and establishes a framework which encourages industry, landowners and agencies to work together constructively to incorporate conservation measures into CBM development. All CBM development will follow the programmatic guidance to address wildlife concerns, and each individual Project Plan will include a site specific Monitoring and Protection Plan which includes mitigation specific to species or local habitats. Over the life of the CBM project, Wildlife Monitoring Protections Plans offer some assurances that management will be adapted to address specific situations.

Those conservation measures specifically addressing concerns for the bald eagle and mountain plover are, in part, as follows:

Bald Eagle

1. If a dead or injured bald eagle is located during construction or operation, the Service's Montana Field Office (406- 449-5225), or the Billings Suboffice (406-247-7367) and the Service's Law Enforcement Office (406-247-7355) will be notified within 24 hours of the next working day.

2. Implementation of the *Coal Bed Methane Programmatic Wildlife Monitoring and Protection Plan for the Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans* (Wildlife Monitoring Protection Plan).

3. Power lines will be built to standards identified by the Avian Power Line Interaction Committee (1996), and additional standards as outlined in the Wildlife Monitoring and Protection Plan, to minimize electrocution potential.

1. Surveys for active raptor nests and winter roost sites will be conducted prior to construction within a 0.5-mile width for bald eagles and bald eagle nests and within 1.0 mile width for roosts. If the proposed CBM site is found to be within a nesting or winter foraging area, CBM work will be halted until the nest is no longer active or until winter has passed and the foraging eagles have migrated. BLM leasing stipulations pertaining to bald eagles apply and will be implemented. This includes No Surface Occupancy (NSO) within ½ mile of nests active in the last 7 years and ½ mile of roost sites. Raptor inventories will be conducted over the entire CBM project area every 5 years by BLM and MFWP. These inventories should be repeated every 5 years (in areas with < 4 well locations/section) thereafter for the Life-of-the-Project (LOP) to monitor trends in habitat use.

2. Nest productivity will be conducted by the BLM or a BLM approved biologist in areas with high levels of development (i.e., areas with greater than or equal to 4 well locations/section) on and within 1 mile of the project area. Active nests located within one mile of project-related disturbance areas will be monitored between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings per nest).

3. A seasonal minimum disturbance-free buffer zone of ½-mile would be established for all bald eagle nest sites (February 15 - August 15). These spatial and timing restrictions may be adjusted based on site-specific criteria after written approval from the Service.

4. Use signing, post speed limits or construct speed bumps on all project access roads to reduce mortality caused by vehicle traffic.

Mountain Plover

5. Operators and the BLM shall be provided by the Service with educational material illustrating and describing the mountain plover, its habitat needs, life history, threats, and gas development activities that may lead to incidental take of eggs, chicks, or adults with requirements that these materials be posted in common areas and circulated in a memorandum among all employees and service providers.

6. If a dead or injured mountain plover is located during construction or operation, the Service's Montana Field Office (406- 449-5225), or the Billings Suboffice (406-247-7367) and the Service's Law Enforcement Office (406-247-7355) will be notified within 24 hours of the next working day.

7. The BLM, FWS and MFWP will estimate potential mountain plover habitat across the CBM area using a predictive habitat model. Over the next 5 years, information will be refined by field validation using most current Service mountain plover survey guidelines (U.S. Fish and Wildlife Service 2002c) to determine the presence/absence of potentially suitable mountain plover habitat. In areas of suitable mountain plover habitat, surveys will be conducted by the BLM or a BLM-approved Operator biologist using the Service protocol at a specific project area plus a 0.5-mile buffer. Efforts will be made to identify mountain plover nesting areas that are not subject to CBM development to be used as reference sites. Comparisons will be made of the trends in mountain plover nesting occupancy between these reference areas and areas experiencing CBM development.

8. Surveys for nesting mountain plovers will be conducted by appropriately trained personnel if ground disturbing activities are anticipated to occur between April 10 and July 10. A disturbance-free buffer zone of 1/4 mile will be established around all mountain plover nesting locations between April 1 and July 31.

9. No ground-disturbing activities shall occur in suitable nesting habitat prior to surveys conducted in compliance with the Service's Mountain Plover Survey Guidelines (U.S. Fish and Wildlife Service 2002c or more recent version), regardless of the timing of the disturbance. If occupied mountain plover nesting habitat is located, the BLM shall reinitiate consultation with the Service on any project-related activities for such habitat. The amount and nature of ground-disturbing activity shall be limited within identified nesting areas in a manner to avoid the abandonment of these areas.

## STATUS OF SPECIES

### Bald eagle

On February 14, 1978, the bald eagle was listed as endangered in all of the conterminous United States except Minnesota, Wisconsin, Michigan, Oregon, and Washington, where it was classified as threatened (43 F.R. 6233). The Service reclassified the bald eagle from endangered to threatened throughout its range in the lower 48 states in a notice published in the Federal Register on July, 12, 1995 (60 F.R. 36000). A proposal to de-list the bald eagle was published in the Federal Register on July 6, 1999 (64 F.R. 36454). Currently, the proposal has not been finalized or withdrawn.

Description

The bald eagle is a large, long-lived bird of prey. Adults have dark-brown bodies, white heads and white tails. This adult plumage is not acquired until age four at the earliest. Juveniles go through a series of plumages prior to achieving the adult coloration and in some plumages the young bear a superficial resemblance to golden eagles (*Aquila chrysaetos*).

Life History/Habitat Use

The eagle may live up to 45 years, achieve sexual maturity at 4 to 5 years, and produce one to three young per year. Publications by the U.S. Army Corps of Engineers (1979), Lincer et al. (1979), Brown and Amadon (1968), and U.S. Bureau of Land Management (1973) provide references on the biology of the species.

Bald eagles usually nest in trees near water, but are known to nest on cliffs and the ground. Nest sites are usually in large trees along shorelines in relatively remote areas that are free of disturbance (U.S. Fish and Wildlife Service 1999). The bald eagle typically lays a clutch ranging from 1 to 3 eggs which are incubated by both the male and female birds for approximately 35 days resulting in usually 1 or 2 eaglets produced by the pair (Stalmaster 1987). Typically, the recommended spatial buffers around nests for threatened and endangered raptors, including the bald eagle, are 1.0 miles (Romin and Muck 1999). The Montana Bald Eagle Management Plan (Montana Bald Eagle Working Group (MBEWG) 1994), identifies three concentric nest management zones, that surround most recently active and alternate nest sites, and vary by degree of allowable disturbance. Zone I includes the primary nest site area in which human activity or development may stimulate abandonment of the breeding area, affect successful completion of the nesting cycle or reduce productivity (MBEWG 1994). It includes the area within a 1/4 mile radius of all nest sites in the breeding area that have been active within 5 years or is presently active. Zone II is the Primary Use Area that includes the area 1/4 mile to ½ mile from all nest sites that have been active within 5 years. Zone III represents most of the home range used by eagles during the nesting season and usually includes all suitable foraging habitat within 2.5 miles of all nest sites in the breeding area that have been active within 5 years (MBEWG 1994).

For the purposes of this biological opinion, bald eagle habitat is defined as all suitable foraging habitat within 2.5 miles of all historic, abandoned and currently active bald eagle nests. Bald eagle nesting habitat is also defined as any mature stand of conifer or cottonwood trees in association with rivers, streams, reservoirs, lakes or any significant body of water. Bald eagle roosting habitat is defined as any mature stands of conifer and cottonwood trees

Research shows that bald eagles are sensitive to a variety of human activities. Responses to human disturbance vary from short term, temporal, and spatial avoidance of disturbance, to total reproductive failure and abandonment of breeding areas (Greater Yellowstone Bald Eagle Working Group (GYBEWG) 1996; Anthony et al. 1995; Stalmaster and Newman 1978). Responses of bald eagles to human disturbance vary depending on the eagle individual/pair, and the type, intensity, duration, time of year, predictability, and location of human activity (Knight and Cole 1995). Survival of individual eagles, particularly those in their first year of life, probably depends heavily on conditions they encounter during the wintering period. The physiological condition of adults at the beginning of each breeding season, an important factor influencing reproductive success, also is affected by how well their energy demands are met in wintering areas. Thus, the survival and recovery of nesting populations depends on the eagles having suitable locations to use throughout the wintering period each year (U.S. Fish and Wildlife Service 1983). Nesting chronology, although variable, is well documented for bald eagles in Montana (U.S. Fish and Wildlife Service 1986). Bald eagles are extremely sensitive to disturbance during nest building, egg laying, and incubation periods (February 1 through May 30). Bald eagles are most likely to desert nest sites during this period if disturbed (MBEWG 1994), especially if the activity occurs within Nest Management Zones I and II.

During migration and at wintering sites, eagles that concentrate on locally abundant food tend to roost communally. Communal roosts usually are located in stands of mature old growth conifers or cottonwoods, and roosts may be several miles from feeding sites. Wintering bald eagles occur throughout the Nation but are most numerous in the West and Midwest (U.S. Fish and Wildlife Service 1983). An abundant, readily available food supply in conjunction with one or more suitable night roost sites is the primary feature of winter habitat. Also, eagles prefer to forage in areas with the least human disturbance ( U.S. Fish and Wildlife Service 1978, McGarigal et al. 1991).

The majority of wintering eagles are found near open water where they feed on fish and waterfowl, usually taking those which are dead, crippled, or otherwise vulnerable (U.S. Fish and Wildlife Service 1983, Lingle and Krapu 1986, Stalmaster and Associates 1990). In addition, eagles are known to feed on carrion, small mammals, and game birds (Lish 1975, U.S. Bureau of Reclamation 1981, Lingle and Krapu 1986). Lingle and Krapu (1986) found eagles consumed at least 50 species of fish, birds, and mammals along the North Platte and Platte Rivers during the winters of 1978-1979 and 1979-1980.

Large, live trees in sheltered areas provide a more favorable thermal environment and help minimize the energy stress encountered by wintering eagles. Communal roosting also may facilitate food finding (Steenhof 1976) and pair bonding. The proximity of adequate night roosts to the other habitats required by wintering eagles, such as hunting perches and feeding sites, is important (Steenhof et al. 1980). In some locations, the absence of a suitable night roost may limit the use of otherwise suitable habitat. Freedom from human disturbance also is important in communal roost site selection (Steenhof et al. 1980, U.S. Bureau of Reclamation 1981, U.S. Fish and Wildlife Service 1986, Buehler et al. 1991). Continued human disturbance of a night roost may cause eagles to abandon an area (Hansen et al. 1981, Keister 1981). Typically, buffers around roost sites are one-half the size of buffers around nest sites, so a seasonal buffer zone for wintering bald eagles would be ½ mile (Romin and Muck 1999).

In Montana, roost sites are usually located in stands of mature or old growth conifers or cottonwoods. A communal roost is defined as an area usually less than 10 acres in size that contains greater or equal than 6 bald eagles on any given night. Critical roost sites are defined as exhibiting traditional use for equal or greater than 5 years, and contain equal or greater than 15 eagles per night for equal or greater than 14 nights per season (U.S. Fish and Wildlife Service 1983). A vital roost site is any communal roost that does not meet criteria for critical status but has local or regional significance in terms of unique features or importance to the local population of bald eagles (MBEWG 1994). For instance, a communal roost located in an area with no other roosting opportunities and geographically isolated from other wintering aggregations may be vitally important to eagles using the site (mature timber stand on the eastern prairie)(MBEWG 1994). No critical winter roost sites had been identified in Montana before the 1990's, although over 600 bald eagles winter in Montana (Flath et al. 1991). A vital winter roost site is located in the planning area along the Yellowstone River near Pompey's Pillar in Yellowstone County. Between February and March each year, 2 to100 bald eagles roost within cottonwood trees up and downstream from Pompey's Pillar (Parks, U.S. Bureau of Land Management, pers. comm. 2002). Critical roost sites may exist within the planning area but, have not yet been located (Flath, Montana Dept. of Fish, Wildlife and Parks, pers. comm. 2002). For the purposes of this biological opinion, an occupied roost site or roost, is defined as a stand of mature or old growth conifer or cottonwood trees that contains greater or equal to 6 bald eagles on any given night.

Although eagle population studies have revealed that both reproduction and survival are important, changes in survival rates seem to have more effect on the population than similar changes in reproductive rates (Grier 1980). Hypothetical population modeling indicates it is possible for eagle populations with lower reproduction but adequate survival to do better than other populations with higher reproduction but poor survival. Adult eagles must prepare themselves for the next breeding season, and subadults and immature eagles must survive stressful environmental conditions. Therefore, maintaining and/or improving winter survival is crucial to eagle recovery (U.S. Fish and Wildlife Service 1978 and 1983).

### Distribution

Historically, the bald eagle nested in at least 45 of the contiguous 48 states, with an estimated 250,000 - 500,000 bald eagles living on the North American continent before the first Europeans arrived. The breeding range of the bald eagle was greatly diminished during the 19th and 20th centuries. Present-day breeding occurs primarily in northern California, Alaska, Oregon, Washington, Minnesota, Wisconsin, Michigan, Maine, the Chesapeake Bay area, Florida, the tri-state corner of Idaho, Montana, and Wyoming, and in parts of Canada. The Service estimated the breeding population exceeded 5,748 occupied breeding areas in 1998 (U.S. Fish and Wildlife Service 1999). Bald eagles winter throughout the country, but are most abundant in the West and Midwest.

Bald eagles occur year-round in Montana and occur in all 49 latilongs (Bergeron et al. 1992, Montana Bird Distribution Committee (MBDC) 1996) . Currently, about 75% of nesting pairs in Montana can be found in the western third of the state west of the Rocky Mountain Front (Montana Bald Eagle Working Group (MBEWG) 1994). Most breeding areas are associated with large montane rivers, lakes, impoundments and coniferous and cottonwood (*Populus spp.*) forests. The remaining 25% of pairs are scattered throughout the eastern two thirds of the state along major prairie rivers. Most prairie breeding areas are associated with the Yellowstone River, but a number of bald eagles nest along the Bighorn, Tongue and lower Missouri Rivers (MBEWG 1994). Wintering and Migration habitat is distributed throughout Montana.

In 1978 there were only 12 breeding areas for bald eagles known in Montana (Servheen 1978). In the of autumn 1995, 222 current or historical breeding areas were known in Montana (MBEWG 1995). By the end of 2001, of the 297 know bald eagle nesting territories in the state, 220 of the 261 territories surveyed were active (MBEWG 2001). Out of the 220 active nests, 188 were successful, producing 347 young.

The Pacific Bald Eagle Recovery Plan (U.S. Fish and Wildlife Service 1986) uses the zone approach to differentiate subpopulations and habitat important to bald eagle recovery in the Pacific recovery area. The management zone approach is central to the recovery process because establishment of well-distributed bald eagle populations and habitats is essential for recovery of the species in the recovery area.

There are seven bald eagle management zones in Montana. The proposed action is located in six of the seven management zones (Zone 18, 39, 40, 41, and 47). The majority of CBM development will occur in Management Zone 40 and 41. Management Zone 40 includes the Yellowstone and Bighorn River watersheds from the town of Emigrant to the mouth of the Bighorn River. Management Zone 41 includes lands drained by the Yellowstone River and its tributaries from the mount of the Bighorn River to the North Dakota border. Floodplains of the Yellowstone, Powder, and Tongue Rivers support mature cottonwood forests. In 2001, there were 72 known bald eagle nesting territories in Zones 40 and 41 combined.

Bald eagle seasonal habitat quality depends on the presence and abundance of food usually associated with open water, availability of secure night roost sites and freedom from human harassment and dictates the amount and extent of use of specific wintering grounds and areas used during migration (MBEWG 1994). Bald eagles wintering in Montana tend to congregate near bodies of water and roost communally. Major rivers and large lakes constitute the majority of winter habitats used although temporary presence of high quality foods may entice eagles to areas far removed from aquatic zones. Wintering eagles are often observed in uplands, foraging on carcasses associated with late ungulate harvests and big game wintering grounds. Eagles may travel several miles to roost sites (MBEWG 1994).

Records for wintering bald eagles in Montana exist for most of the latilongs included in the project area (Bergeron 1992, MBDC 1996). Counts of wintering eagles are very variable from year to year, and are not useful for trend analysis. The BLM has been conducting bald eagle midwinter surveys along the Powder River in both Custer and Powder River Counties for several years. Observations of bald eagles since 1993 ranged from 8 to 57 bald eagles (Baker 2002). Incidental observations of wintering bald eagles in Powder River and Rosebud Counties by the Forest Service, are of a few each winter, mostly associated with small ponds and roadkills (Sasse, U.S. Forest Service, pers.comm. 2002).

During migration, bald eagles could be observed in any area or habitat with BLM's planning area. Migration paths of adult bald eagles from the wintering grounds in the southern Rocky Mountain Region passed through eastern Montana in early April (Harmata 1984). A minimum of 8 times as many bald eagles migrate through the lower Yellowstone River area of eastern Montana as winter there (Swenson et al. 1981, Sevenson 1983).

Status and Threats

Montana is included in the seven-state Pacific Bald Eagle Recovery Area. (U.S. Fish and Wildlife Service 1986). The primary objective of this area is to provide secure habitat for bald eagles within the 7-state Pacific recovery area and to increase population levels in specific geographic areas to the extent that the species can be de-listed. The primary recovery objectives for this area are to provide secure habitat for bald eagles and increase populations in specific geographic areas. De-listing should occur on a region-wide basis and should be based on the following criteria: (1) a minimum of 800 pairs nesting in the seven-state recovery area; (2) these pairs should annually produce an average of at least 1.0 fledged young per pair, with an average success rate per occupied site of not less than 65% over a five-year period; (3) population recovery goals must be met in at least 80% of the management zones that have nesting potential; and (4) a persistent, long-term decline in any sizeable (greater than 100 eagles) wintering aggregation would provide evidence for not de-listing the species (U.S. Fish and Wildlife Service 1986). Another recovery criteria is to have stable or increasing wintering populations.

The decline in nesting populations during the 20th century has been attributed to habitat loss (identified as the most significant long-term threat to all bald eagle populations in the recovery area), environmental contamination, electrocution, shooting, vehicular collisions, poisoning, and trapping (U.S. Fish and Wildlife Service 1986). These problems still exist today and are a growing concern (Hartman, U.S. Fish and Wildlife Service, pers. comm. 2002). Numerous cases of bald eagle and golden eagle poisoning have been caused by landowners unlawfully misusing pesticides and other chemicals for predator control.

By the late 1960's, the pesticide dichloro-diphenyl-trichloroethane (DDT) and its metabolites had caused widespread reproductive failures and resulted in drastic decreases in eagle numbers continent-wide (Sprunt et al. 1973, Wieneuyer et al. 1972). Other contaminants such as polychlorinated biphenyls and heavy metals such as mercury and lead may contribute to increased eagle mortality in some areas. The exact impact of DDT and other contaminants on Wyoming eagles is not known.

Secondary poisoning in eagles from eating lead-poisoned prey, particularly ducks and geese, was a concern identified in the early 1980's by Pattee and Hennes (1983). They reported that of 650 dead eagles, 7.2 percent probably died from lead poisoning. Their field evaluations in Missouri and Minnesota found 9-11 percent of digested eagle pellets contained lead shot. However, Lingle and Krapu (1988) found in a wintering eagle study (1978-1980) that cast pellets contained a small percentage (0.3 percent) of lead shot. Due to the use of nontoxic shot being phased in during the 1980's and now required in many areas across the nation, the potential for eagles to suffer ill-effects or death from lead shot ingestion has likely decreased.

Loss of eagle habitat continues to impact bald populations within the 7-state Pacific recovery area. Development, both urban and recreational, logging, mineral exploration and extraction, as well as others forms of human activity are adversely affecting suitable breeding, foraging and wintering habitats (U.S. Fish and Wildlife Service 1986). The Pacific Bald Eagle Recovery Plan (1986) originally identified the cumulative long-term effects of small scale actions and individual projects, while not jeopardizing the continued existence of the species, are the single most important threat to bald eagle recovery. Increased human activity and various land developments can adversely affect the suitability of breeding and wintering habitats (Juenemann and Frenzel 1972, Lish 1975, Grubb and King 1991).

Electrocution and collision with power lines has been a significant cause of mortality for golden and bald eagles. Before the 1970's, raptor electrocution had been noted by several researchers (Hallinan 1922, Marshall 1940, Edwards 1969, Coon et al. 1970). However, it was not until the 1970's, that its magnitude was known. Efforts to reduce power line mortalities by biologists, the utility industry, federal and state agencies, led to the publication of *Suggested Practices For Raptor Protection On Power Lines* (Miller et al. 1975) and *Mitigating Bird Collisions With Power Lines: The State of the Art in 1994 (Avian Power Line Interaction Committee (APLIC) 1994).* Despite the publication of *Suggested Practices* in 1975,1981,and 1996, and efforts on the part of the electric industry to correct many problem power lines, researchers have continued to report raptor use of power lines, and raptor electrocution deaths (APLIC 1996). Literature accounts from North America since 1981 indicate that the raptor electrocution problem is still widespread (APLIC 1996).

Electrocution deaths of bald eagles have been documented across the country, including Montana (APLIC) 1996). Bald eagle losses to electrocution were probably underestimated in the 1970,s and early 1980's because studies were not conducted in areas with bald eagle concentrations. Bald eagles frequently congregate in large numbers during the winter (Stalmaster 1987). In predominately treeless areas, such as coal bed methane fields in Montana and Wyoming, power poles may be the only perches available to bald eagles. The National Wildlife Health Laboratory (1985) reported that 130 (9.1%) of 1,429 dead bald eagles examined from 1963-1984 were electrocuted, with 55% of those mortalities occurring between 1978-1984. Franson et al.(1995), summarized that 12 % of the known bald eagle mortalities were the result of electrocution. Between 1986 and 1996 electric utility company records from across the western United States and Canada documented 118 bald eagles, 272 golden eagles, and an additional 358 unidentified eagles were electrocuted (Harness 1997).

Approximately 77 eagles have been electrocuted on power lines, including 1 bald eagle, in the past year in the Powder River Basin in Wyoming (Associated Press 2002). In Montana, within the Powder River and Billings RMP project area, eagle mortality from electrocution and collision from small distribution power lines common to oil and gas development was documented in 2000 and 2001 (Schomburg 2001). Although data was collected from 303 carcasses from 1996-2001, data from 273 carcasses were collected in 2000 and 2001. Cause of death of 23 raptor carcasses were attributed to mid-span collisions, with 21 identified as golden eagle (*Aquila chrysaetos)* and one as bald eagle (Schomburg 2001). Cause of death of 280 raptor carcasses were attributed to electrocution, with 219 identified as golden eagle, 4 were bald eagle and 11 were either golden or bald eagles (Schomburg 2002). Data were collected from 4090 power poles in an area of ongoing efforts to modify power poles to reduce the probability of electrocutions. Northwestern Power, a major utility company in Montana, documents one to two bald eagle electrocutions each year in Montana (Milodragonovich, Northwestern Energy, pers. Comm. 2002). Within the last year, the Service has received information on eleven eagle mortalities in the Great Falls and surrounding area (Speckman, U.S. Fish and Wildlife Service, pers. Comm. 2002). Three eagles were killed by vehicular collisions (two bald eagles) and eight eagles were electrocuted (four bald eagles).

## **Proposed Species/Critical Habitat:**

### **Mountain Plover**

On December 30, 1982, the Service designated the mountain plover as a category 2 candidate species, meaning that more information was necessary to determine whether the species status was declining, stable, or improving (47 FR 58458). In 1990, we prepared a status report on the mountain plover indicating that Federal listing may be warranted (Leachman and Osmundson 1990). We elevated the mountain plover to a category 1 candidate species in the November 15, 1994, Animal Candidate Notice of Review (59 FR 58982). At that time, category 1 candidate species were defined as those species for which we had sufficient information on biological vulnerability and threats to support issuance of a proposed rule to list. A proposed rule to list the mountain plover as threatened was published on February 16, 1999 (64 FR 7587). A final listing decision on this species is pending.

Description

The mountain plover is a small bird, about the size of a killdeer (*Charadrius vociferus*) and is the sole member of the plover family (Family *Charadriidae*) that inhabits grasslands on a year-long basis. The type specimen was collected in 1837 by J. K. Townsend on the Sweetwater River of Wyoming. There are no recognized subspecies. It is a compact bird (about 7-9 inches long) with light brown above and paler underparts, lacking the contrasting dark breast bands typical of many other plover species. In flight, its underwings are white. Breeding plumage differs only by the addition of a dark line between the bill and eyes contrasting with a pale forehead. The bill is black, the legs are gray to light brown-yellow, feet are dark brown, and claws are black. The sexes are similar in appearance.

Life History/Habitat Use

The mountain plover is a migratory species of the shortgrass prairie and shrub-steppe eco-regions of the arid West. The universal characteristics of mountain plover habitat on both the breeding and wintering grounds are short vegetation, bare ground, and flat topography. They are found associated with prairie dog towns, plains, alkali flats, agricultural lands, cultivated lands, sod farms, prairie dog towns, and low shrubs at both breeding and wintering locales. Unlike other plovers, they are rarely associated with water.

In Montana, there is compelling evidence that mountain plovers are dependent on active prairie dog colonies for nesting (Dinsmore 2000). Mountain plover selectively use black-tailed prairie dog towns (*Cynomys ludovicianus)* for breeding, nesting, and feeding (Knowles et al. 1982, Knowles and Knowles 1984, Olson 1985, Olson and Edge 1985, Olson-Edge and Edge 1987, Dinsmore 2000, Dinsmore 2001, Knowles and Knowles 2001). Not all prairie dog towns offer suitable habitat for mountain plover, mostly due to topographic incompatibility. There are habitats other than prairie dog towns that provide nesting, feeding and breeding habitat for mountain plover in Montana. Knowles and Knowles (1998) demonstrated that barren areas with glacial tell, stockwater sites grazed by sheep ,cattle and ground squirrels, dwarf shrub communities associated with silty overflow sites and bentonitic soils, all have some levels of documented mountain plover use. Livestock and/or bison (*Bison bison*) grazing on prairie dog towns will increase mountain plover use substantially Knowles and Knowles (2001). Knowles and Knowles (2001) still conclude that "based on historical notes and contemporary observations, viable populations of mountain plovers are probably dependent upon extensive areas of black-tailed prairie dog colonies.

The dependency of mountain plovers on prairie dogs in Montana is probably tied to two factors: habitat and food (Dinsmore 2001). Mountain plovers prefer to nest on flat, arid landscapes, especially in areas that are intensively grazed (Knopf 1996). In Montana, the only open, grazed habitat is found on active prairie dog colonies (Dinsmore 2001). Prairie dog colonies also harbor more food items than the surroundings habitats (Dinsmore 2001, Knopf 1996). Mountain plovers are insectivorous with beetles, grasshoppers, crickets, and ants as their principal food items (Rosenberg et al. 1991).

Mountain plovers have a rapid-clutch mating system in which a female may lay a clutch for a male and then lay a second clutch for herself (Graul 1973, Dinsmore 2001). The nest of the mountain plover is a simple scrape on the ground, which may be lined with debris. Nests are usually placed in areas where vegetation is less than 4 inches in height, the amount of bare ground in the area exceeds 30%, and near a conspicuous object such as a manure pile or rocky area. In shortgrass prairie habitat, vegetation associated with nest sites includes *Bouteloua gracilis* (blue grama), *Buchloe dactyloides* (buffalo grass) and *Opuntia* spp. (prickly pear cactus). In shrub-steppe grasslands, vegetation around nests includes low-growing shrubs such as *Artemisia nova* (black sage) and *Atriplex gardneri* (Gardner saltbush) (Day 1994, Knopf 1996). Topography is typically flat or gently rolling. Nests occur on ground with less than 5 percent slope, which is commonly heavily grazed by domestic livestock and/or prairie dogs (Graul 1973,

Kantrud and Kologiski 1982, Knowles and Knowles 1998). Generally, "suitable mountain plover habitat" refers to areas containing these characteristics: low relief, vegetation generally less than 4 inches in height, and bare ground present and at least locally exceeding 30% of the area.

The breeding season begins soon after birds arrive in late March or early April. In Montana, mountain plovers do not arrive on breeding grounds until the latter part of April. Breeding season displays involve different calls and flight displays, including "falling leaf" and pursuit flights to advertize territory occupancy and define boundaries between territories. Territories in Colorado are about 40 acres, and adjacent territories may overlap significantly along boundaries. Breeding plovers show close site fidelity, often returning to the same territory in subsequent years. Territories tend to be aggregated with several breeding pairs occurring within a few square miles surrounded by empty but apparently suitable habitat (Knopf 1996).

Nests may be initiated 1-2 weeks after arrival on the breeding grounds and the clutch of 3 eggs may take 3-12 days to complete. Incubation lasts approximately 29 days. In Colorado, egg-laying began April 15, continuing through mid-June, with one late nest observed June 23. Adults were found to incubate or attend nests with increasing frequency and duration as the incubation period continued. Nest attendance in Wyoming increased from approximately 50% of daylight hours early in incubation to approximately 100% within days of hatching (Laun 1957). Eggs appear highly resistant to chilling but susceptible to overheating in the sun due to their dark coloration (Knopf 1996). Mountain plovers nest on nearly level groung (often near roads), adults and chicks often feed on or near roads, and roads may be used as travel corridors by mountain plovers, all of which make plovers susceptible to being killed by vehicles (McCafferty 1930, Laun 1957, Godbey 1992, Knowles and Knowles 1996).

Chicks leave the nest soon after the last egg hatches. Chicks are usually attended by one adult, brooded about one-third of the time for the first day. Daily movements of the broods may be extensive, with broods ranging over as much as 200 acres between hatch and fledglings. Chicks fledge approximately 33 days post-hatch (Knopf 1996).

Known predators of adult mountain plovers are few. Kit fox (*Vulpes macrotis*) and prairie falcon (*Falco mexicanus*) are the only documented predators of adults. However, their ground nests are vulnerable to mammalian predators including the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), swift fox, badger, and coyote, and possibly corvids (crows, ravens and magpies). Ground squirrels, coyotes, Swainson's hawks (*Buteo swainsonii*), prairie falcons, and loggerhead shrikes (*Lanius ludovicianus*) have been observed taking flightless young (Knopf 1996).

Species in the shorebird family are generally long-lived, with low annual reproductive rates and small clutch sizes. Available information on the mountain plover conforms to this pattern. Annual survival estimates for this species are unavailable, though over-winter survival is high, estimated at 0.9474 from a sample of 44 birds (Knopf 1996). Few data exist on the life span of the mountain plover, though one banded bird was recovered after 6 years.

Mountain plovers probably start breeding in their second year of life. Normal clutch size is 3, very rarely 4. Two-egg clutches probably result from predation of individual eggs. Birds are largely monogamous, though the pair bond is only maintained for a short period during breeding. There is some evidence that at least some females lay two clutches, one brooded by the male and the other by the female, with this strategy common in some years (Knopf 1996).

Nest success has been estimated to vary from 26-65% between years and may be influenced by rainfall. Mountain plovers in Weld County, Colorado, fledged an estimated 0.26 and 1.4 young per nest in different studies between 1969 and 1974, though the higher estimate is believed to be biased by the exclusion of nests which totally failed (Knopf 1996). In Phillips County, Montana, annual nest success was between 45% in 1999 and 72% in 2000 with a average annual nest success of 58% for 600 nests pooled across years (Dinsmore 2001).

## Distribution

Mountain plovers occupy suitable breeding habitat in many of the Great Plains states from Canada south to Texas from late March through July. Flocks may form as early as mid-June prior to migration to wintering habitats in August through October. Wintering areas are concentrated in the Central Valley of California, Texas and Mexico. There are no wintering areas in Montana and Wyoming. Historically, the mountain plover was considered numerous on breeding grounds in western and central Kansas and Oklahoma, western Nebraska and South Dakota, and eastern Colorado, Montana, and Wyoming.

Montana, Colorado and Wyoming have the majority of breeding mountain plovers, although some breed in Kansas, Nebraska, New Mexico, and Oklahoma (U.S. Fish and Wildlife Service 2002a). Based on historic records for Montana, the mountain plover was found throughout the shortgrass habitats of Montana, east of the Continental Divide (Knowles and Knowles 1998). Knowles and Knowles (1998) presents historic documentation of mountain plover within parts of the BLM's project area: in 1879, McChesney regarded the mountain plover as abundant around Big Horn County; in 1903 Silloway considered the mountain plover as a regular summer resident in parts of Judith Basin, Wheatland, Golden Valley and Musselshell Counties; and in 1911, Saunders considered the mountain plover as a common grassland species in areas including Gallatin County. More recent records of mountain plover in Dawson, Garfield, Prairie, Custer, Carter, Bighorn, Blaine, Phillips, Wheatland, Golden Valley, Treasure, Musselshell and Carbon Counties can be found in Knowles and Knowles (1998).

Approximately 1,500 birds are estimated to occur in Wyoming, some in areas adjacent to proposed CBM development in Montana. Birds have been observed during the breeding season over much of the shortgrass prairie of the eastern parts of Wyoming, with high densities reported in the Laramie Plains of northern Albany County and eastern Carbon County (Laun 1957, Johnson et al. 2000), Converse County (Parrish 1988), Laramie County (Graul 1975), Park County (U.S. Bureau of Land Management 1988), and Sweetwater County (Beauvais and Smith 1999).

## Status and Threats

Endemic grassland birds have declined more rapidly than other bird species, and the mountain plover's decline is greater than the other grassland endemics (Knopf 1994, Sauer et al. 1997). Available data indicate that population numbers of mountain plovers have declined range-wide by more than 50 percent since 1966 to fewer than 10,000 birds. The eastern extent of the range has been greatly reduced, possibly due to conversion of native prairie to cultivated agriculture as well as control of burrowing rodents. Mountain plovers are no longer known to breed in Canada or South Dakota.

Graul and Webster (1976) estimated mountain plover numbers and distribution in Montana and Wyoming at 88,400 birds. In Montana, Knowles and Knowles (1996) estimated less than 2,000 mountain plovers in Phillips and Blaine counties, and less than 800 individuals at the other 8 occupied locations in the State. Following six years of research, Dinsmore (2001) estimated a population of 95 - 180 individual breeding mountain plovers in his study area in southern Phillips County, which was lower than his earlier estimate of 400 - 500 individuals. Dinsmore's (2001) south Phillips County study area is the best mountain plover habitat in Montana. While other areas of Phillips and Blaine counties, and other locations in the State, have more acres of suitable mountain plover habitat, the density of nesting mountain plovers is less than that found in southern Phillips County. Based on his six years of research, Dinsmore (pers. comm. 2002) believes it is unlikely that there are more than 700 mountain plovers throughout all of Phillips and Blaine counties, but that the Knowles and Knowles (1996) estimate of 800 mountain plovers in other areas of Montana is reasonable. Therefore, we believe the best information currently available indicates the total population in Montana is less than 1,500 mountain plovers (Knowles and Knowles 1996, Knowles and Knowles 1998, Dinsmore 2001, U.S. Fish and Wildlife Service 2002a).

Identified or suspected reasons for the decline include conversion of shortgrass and shrub steppe habitats, changes in range management to emphasize uniform grass cover, declines in native ungulates and burrowing animals, oil and gas development and associated road construction, and possibly population sinks created by certain agricultural practices. A population 'sink' (Pulliam 1988) is an area within the breeding range of a species or population where reproduction is not adequate to balance mortality, but population levels are maintained by immigration of breeders produced in a nearby 'source' area.

Strategies adopted by the Forest Service (FS) and BLM, should be effective in minimizing impacts on Federal lands, but the likelihood of these measures being implemented on split-estate lands or private property is less than for the activities on Federal lands (U.S. Fish and Wildlife Service 2002a). The time-of-year and spatial buffers adopted by the FS and BLM to protect nesting birds would only have value when the essential nesting characteristics are not permanently altered. In the absence of such provisions, however, and given the current rate of oil and gas development, the Service believes that oil and gas development could be a threat to mountain plovers and their habitat (Brockway 1992).

## ENVIRONMENTAL BASELINE

### Listed Species/Critical Habitat:

### Bald Eagle

Under the provisions of section 7 (a)(2), when considering the "effects of the action" on listed species, the Service is required to consider the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, tribal, local, and private actions and other human activities in the action area (50 CFR 404.02). Unrelated Federal actions affecting the same species or critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are Federal and other actions within the action area that may benefit listed species or critical. There is no critical habitat designated for the bald eagle, so none will be impacted.

In the Service's November 8, 1995, biological opinion addressing the proposed Tongue River Rail Road Company's additional rail line from Ashland to Decker, Montana, in the Powder River Basin (U.S. Fish and Wildlife Service 1995), the Service anticipated one bald eagle could be lethally taken as a consequence of increased disturbance. The incidental take was expected to occur as a result of potential premature fledglings and/or nest abandonment during the construction phase and possible train strikes of adult birds during the operational phase. The Tongue River Rail Road biological opinion considered impacts to bald eagles in a area that is a part of the current action on coal bed methane.

Although, the majority of bald eagle nesting territories occur in western Montana, a significant number of bald eagles nest within or adjacent to the proposed activities. Bald eagles winter throughout these areas, locally concentrated by open water, roost sites or available prey (that may not be associated by aquatic sites). It is estimated that an average 10-15 bald eagles winter along the Tongue River below the Tongue River dam (U.S. Fish and Wildlife Service, 1992). Fluctuating numbers of bald eagles winter along the Yellowstone and its other major tributaries. Significant numbers of eagles pass through these areas as migrants.

In Wyoming, there are 10 historically active bald eagle nests within the Powder River Basin Oil and Gas project area. Forty-two bald eagle winter roosts have been documented within the project area. The eastern front of the Big Horn Mountains and the Powder River Basin is a known wintering area for bald eagles and observations of bald eagles are common during the winter months.

In the Montana and Wyoming, both portions of the Powder River Basin contain a large proportion of private land and tribal lands within the project area which have not been surveyed, additional winter roost sites likely exist.

Historically, these bald eagle nests and winter roosts have been affected by relatively few activities. Grazing has been the predominant land use in the area and has likely had only minimal effects on the eagles and their habitat, although some impacts to riparian areas may have occurred. Conventional oil and gas development continues to occur in the Powder River Basin in both Montana and Wyoming. Drilling for coal bed methane in the Powder River Basin in Wyoming began in 1985. As of May 29, 2002, 13,306 coal bed methane wells have been drilled with roughly 9000 wells in production (U.S. Fish and Wildlife Service 2002b).

Eagle habitat within the project area in the Powder River Basin is also influenced by hydrology changes caused by the Tongue River Dam on the Tongue River and Yellowtail Dam on the Big Horn River, which has limited the magnitude and frequency of flooding which results in less scouring of river banks necessary for cottonwood regeneration. Periodic channel migrations accompanied by erosion of streambanks and deposition of alluvial material to form sandbars is essential to the maintenance of riparian cottonwood communities. Cottonwoods require nonvegetated, recently deposited alluvium for successful seed germination and establishment. Seeds germinate within 48 hours and must have a continuous supply of moisture for several weeks. On-going ranching practices have also resulted in clearing of cottonwoods for alfalfa crops and in combination with grazing practices keep most cottonwood seedlings from becoming established. Additionally, the project area is affected by coal mining operations in both Montana and Wyoming.

### Proposed Species/Critical Habitat:

### Mountain Plover

The BLM indicates in the biological assessment, the status of mountain plover is not well understood within the project area, but may breed within the planning area, particularly in black-tailed prairie dog towns. The Service admits that data are lacking on the occurrence of mountain plover in the planning area. Montana Fish, Wildlife and Parks (Graham, Montana Fish, Wildlife and Parks in litt. 1999) states that "surveys indicate that Montana has a widely distributed population of mountain plover(s) and while the population level fluctuates, it is still substantial". Current (within last few years) documented nesting occurred within the statewide planning area in Phillips, Blaine, Golden Valley, Wheatland, Musselshell, Treasure, Carter, Carbon, and Bighorn Counties (Knowles and Knowles 1998, 1999). Past and present accounts of mountain plovers in Montana imply that mountain plover were restricted to specific (suitable) habitats, but where these habitats were common, so were mountain plover (Knowles and Knowles 1999). Mountain plovers are likely to be found on suitable habitat throughout the entire project area. Mountain plovers are most often associated with relatively flat (less than 5% slope), open short-grass prairie rangelands, often on or near prairie dog towns and other grazed areas. In Montana, the overwhelming majority of nesting birds occur within active prairie dog towns. In the biological assessment, the BLM stated that although specific prairie dog colony information is not available or incomplete, black-tailed prairie dogs are known to be common in preferred habitats throughout the project area. In addition to prairie dogs, livestock grazing is an important land use in the project area, with some areas heavily grazed.

Proctor (1998) developed a GIS (geographic information system) model to provide a methodology for creating habitat maps outlining suitable black-tailed prairie dog habitat on lands in the northern Great Plains shortgrass prairie at a scale that will help identify regional potentials for prairie dog ecosystem recovery, "*including the needs of associated species*." Preferred and Potential suitable habitat categories were developed, and when tested, 94.5% known prairie dog pixels fell within the preferred and potential habitat categories (Proctor 1998). The three categories that identified suitable habitat for black-tailed prairie dogs were the preferred (favored vegetation and favored slope), potential (favored slope, less favored vegetation) and potential (favored vegetation and less favored slope). Favored vegetation can be described as very low cover grassland, salt-desert shrub, dry salt-flats, and mixed barren sites. Favored slope has a 0-4% slope and less favored slope ranges 4-25% slope (Proctor 1998). Mountain plover nests occur on ground with less than 5 percent slope, which is commonly heavily grazed by domestic livestock and/or prairie dogs (Graul 1973, Kantrud and Kologiski 1982, Knowles and Knowles 1998). Because mountain plover unsuitability increases as slope increases over 5%, the black-tailed prairie dog preferred habitat category and potential habitat category with favored slope will, for the purposes of this biological opinion, define suitable habitat for the mountain plover in Montana. The most preferred and valuable suitable habitat is the suitable habitat in this definition that is occupied by black-tailed prairie dogs. Habitat loss is defined as the permanent or temporary alteration of habitat in such a way as to displace a species into unsuitable areas or impair/disrupt or prevent normal behavioral patterns such as breeding, feeding or sheltering. For purposes of quantification of habitat loss, suitable mountain plover habitat will be rendered unsuitable or considered a loss of habitat within 1/4 mile of any long term disturbance, roads, above-ground structures, wells, compressor stations, pipeline and utility corridors.

The preferred habitat for mountain plover occurs in the statewide planning area in the following counties (acres): Treasure (43 acres), Rosebud (147,671 acres), Powder River (166,425 acres), Wheatland (1,448 acres), GoldenValley (1,007 acres), Musselshell (93,015 acres), Sweet Grass (2,965 acres), Stillwater (4,571 acres), Yellowstone (52,855 acres), Big Horn (8,399 acres), Carbon (65,269 acres), Blaine (276,860 acres), Park (4,204 acres), Gallatin (17,151 acres), Carter (444,656 acres), and Custer (233,128 acres) counties. The BLM analysis area excludes suitable mountain plover suitable habitat acreage from Blaine, Gallatin, and Park counties.

We have good estimates of suitable habitat within the analysis area from Proctor (1999). Dinsmore (2001) derived mountain plover population estimates within his study area in south Phillips County and produced an estimate for Blaine and Phillips Counties, Montana (U.S. Fish and Wildlife Service 2002a). Using the same suitable habitat categories from Proctor (1999) in Blaine and Phillips Counties and Dinsmore's population estimates, we can derive the number of plovers per suitable habitat acre. Based on this data, we estimate that there are 710 individuals or 355 pairs of mountain plovers in the federal mineral estate in the project area (0.0005817 mountain plover/acre x 1,221,448 acres of suitable habitat).

Mountain plovers average 2.9 eggs/nest (Knopf 1996) and approximately 90% of all pairs raise 2 nests per pair of mountain plovers with a weighted nest success of 42% (Dinsmore et al. In Press). In Montana, mountain plovers have a fledgling success of approximately 40% (Dinsmore 2001). The mean life span of a mountain plover in Phillips County was 1.25 years (Knopf, U.S. Geological Survey, pers. comm. 2002). Thus, each adult must produce 0.8 chicks per year to replace itself. If each adult must produce 0.8 chicks/year to maintain population, then, 568.4 mountain plover chicks must be recruited in the analysis area each year in order to maintain itself. Based on our population estimate for the analysis area, and previous productivity and success estimates from Montana, only 328.6 chicks would be produced each year in the analysis area. Therefore, this population is likely in decline.

In adjacent areas in Wyoming, the BLM contracted with the Wyoming Natural Diversity Database and Western EcoSystems Technology Inc. to conduct presence/absence surveys for mountain plover in the Powder River Basin during the spring of 2001. A combined total of seven mountain plovers were observed within the Powder River Basin analysis area (Keinath and Ehle, 2001, Good, Young and Eddy, 2002). However, both reports (Keinath and Ehle, 2001) and (Good, Young and Eddy, 2002) qualify their results by noting that due to private landowner considerations survey routes were limited to public roads. Because much of the Powder River Basin in Wyoming is privately owned, areas of suitable habitat were inaccessible and not surveyed. Therefore, the results of these surveys likely underestimate the extent of use of suitable habitat within the Powder River Basin.

Grazing is an important land use in the project area and appears to be compatible, and probably beneficial, to the plover. Coal mining has been an influence in the basin in both Montana and Wyoming. Conventional oil and gas development continues to occur in the Powder River Basin in both Montana and Wyoming. Drilling for coal bed methane in the Powder River Basin in Wyoming began in 1985. As of May 29, 2002, 13,306 coal bed methane wells have been drilled with roughly 9000 wells in production (U.S. Fish and Wildlife Service 2002b).

## EFFECTS OF THE ACTION

### Listed Species/Critical Habitat:

### Bald Eagle

Bald eagles may be affected by the project in several ways, including human disturbance, equipment noise, electrocution, collision with power lines and construction of new roads (collision with vehicles).

Bald eagles are sensitive to a variety of recreational, research, resource and urban development activities. *The Montana Bald Eagle Management Plan* (MBEWG 1994) defined disturbance, to be "any human elicited response that induces a behavioral or physiological change in a bald eagle contradictory to those that facilitate survival and reproduction. Disturbance may include elevated heart or respiratory rate, flushing from a perch or events that cause a bald eagle to avoid an area or nest site." The Service predicts that there will be some disturbance to nesting bald eagles in the project area, but due to stipulations, no productivity should be lost.

The BLM in the revised biological assessment stated that bald eagles are sensitive to human presence. Disturbance to foraging, resting, roosting, or migrating eagles is possible through surface use in other areas not addressed by stipulations. Assumptions listed in the introduction of the Wildlife section (Chapter 4 Wildlife), in the Powder River and Billings Amendment to the RMPs and EIS, including no surface use or occupancy within ½ mile of nests active in the last 7 years and within riparian area nesting habitat, should prevent eagles from abandoning traditional nesting sites in the project area. However, the BLM also envisions that periodic or complete abandonment of non-nesting habitat may occur depending on the level of human use and noise.

Bald eagles may be affected by disturbance near winter roost sites and perch areas. Much of the project area is devoid of significant human disturbance, with grazing as the major land use. Many of the eagles may be unaccustomed to activities involving large equipment and significant human activity for even a short period of time, such as with drilling, construction of power lines and road building. Some eagles may lose foraging opportunities and could even choose to abandon the roost sites completely, depending on the level of activity. Currently, there are no stipulations or no surface occupancy requirements for bald eagle winter roosts. The BLM's commitment to the inventory and monitoring of bald eagle winter roosts as outlined in the Wildlife Monitoring and Protection Plan should lessen the likelihood of roost abandonment. However. The lack of information regarding roost site locations on private land and the lack of surveys for roost sites may leave some roost sites vulnerable to abandonment resulting from human disturbance.

The Service believes that as a direct result of the construction of significant number of miles of new roads and small distribution lines, there will be loss of bald eagles. The BLM's biological assessment states that increased traffic, road kills and carrion, resulting from CBM activities, potentially increases vehicle collision hazard to bald eagles. Bald eagles often forage on carcasses of other animals, particularly in the winter when aquatic food resources are not as readily available. Foraging may also be intensified during the nesting period while adults are feeding nestlings. If there is an increase in carcass availability as a result of collisions with vehicles in the project area or increased big game hunter harvest spoils, bald eagles may increase foraging activities in the project area. Regardless of the BLM's commitments to implement measures to lessen the likelihood of collisions, some will probably occur.

The Service agrees with the BLM's biological assessment that above-ground transmission facilities even with proper design and construction requirements (APLIC 1996), pose an electrocution threat to bald eagles. Power lines also pose strike hazards for bald eagles, especially near perennial rivers and water bodies that support fish and waterfowl. Removal of large trees in wintering areas, particularly at established roost sites, would also displace bald eagles by removing perch and roost sites. Even though, operators may adhere to all the requirements for construction of new power lines or modify existing power lines to be raptor friendly, some eagles may still be lost to line strikes or electrocution.

## **Proposed Species/Critical Habitat:**

### Mountain Plover

Disturbance leading to loss of reproductive potential may occur in several ways. Different effects to nesting plovers are likely depending on the onset, duration, and frequency of human disturbance. Aside from direct take of nests, chicks, and adults through vehicle collision, human disturbance may cause direct loss of eggs or chicks if attending mountain plover adults are displaced long enough to expose the eggs or chicks to excessive heating, chilling, or predation.

If disturbance occurs more frequently than weekly through the breeding season, nesting birds may be displaced and may initiate nests a secure distance from the disturbed area. While this may reduce the amount of nest failure from disturbance, it may nonetheless result in reduced plover reproduction if plovers are displaced to less suitable nesting areas. Indeed, significant amounts of previously occupied habitat may be made unavailable in this way. Preliminary data in Wyoming, from the Foote Creek Rim suggest that breeding plovers may be displaced from areas of high human activity (WEST, Inc. 1999). If nesting birds are displaced to nest in less suitable habitat where nesting success is lower, this would result in lost breeding potential.

If disturbance begins after the onset of nesting or occurs at intervals greater than two weeks apart, birds may have already initiated nesting within the disturbance area. Then, human activity causing displacement of incubating adults from active nests may result in addling eggs due to extremes of temperature or destruction of eggs by predators. During incubation, the mountain plover is fairly insensitive to human disturbance from vehicles as close as 3 meters but may be displaced from the nest by a human on foot at a much greater distance. Eggs or newly hatched chicks may also be crushed by vehicle traffic at any speed. Additionally, the presence of dogs greatly increases the distance at which plovers leave their nests, thus exposing the eggs to predation, chilling, and other adverse effects (F. Knopf, U.S. Geological Survey, Biological Resources Division, pers. comm. 200).

Human disturbance is especially problematic where human activity has created disturbed areas attractive to nesting mountain plovers. In Utah, mountain plovers have been found to nest as close as 6 meters from open roads or operating oil well pads (Ellison et al. 1999), presumably attracted by the abundance of bare soil. Creation of apparently suitable habitat with high levels of human disturbance may actually attract breeding plovers to an 'ecological trap' (Pulliam 1988) where nests are initiated but fail due to disturbance and reproductive effort is wasted.

Mountain plovers are attracted to roads and are known to lead broods onto roads to forage at night (Laun 1957, Ellison et al. 1999). Direct loss of chicks or even adults to vehicle collisions may increase where increasing traffic volumes correspond with concentrations of nesting and brood-rearing activity. The BLM's commitment to establish speed limits or employ other methods, such as speed bumps, on project roads within known nesting areas should help reduce the likelihood of such collisions. However, because the birds may freeze and squat close to the ground in response to approaching vehicles, some level of mortality is likely.

In addition to activities that may lead to direct mortality of adults or young, and reduce production, several factors may lead to indirect mortality. The eggs and young, and to a lesser extent adults, are susceptible to a number of avian and mammalian predators. These include corvids (ravens, magpies, crows), birds of prey (hawks and owls), coyotes, badgers, weasels (*Mustela* spp.), and foxes (*Vulpes* spp.). These predators may benefit from human activities in a number of ways. Power poles, fence posts, associated gas facilities, and other elevated structures may provide new hunting perches and nest sites for avian predators, increasing their hunting effectiveness and range. Buildings, trailers, and other permanent structures may provide safe den sites for mammalian predators. Research on the more well-studied sage grouse (*Centrocercus urophasianus*) has demonstrated that birds avoid elevated perch sites, including power lines and fence posts by as much as ½ mile (Braun 1998). Mountain plover adults, chicks, and eggs live in the same environment and suffer the same predators, therefore these structures may adversely affect their habitat and behavior similarly. The BLM's commitment to minimize hunting perches within known of nesting areas will help minimize the effect.

Finally, an increase in road-killed animals due to more roads and heavier traffic may provide an increased food supply for both avian and mammalian predators, most of which are also scavengers. This increased food source may increase predator population size and may also extend their range into previously uninhabited areas, leading to higher rates of predation on mountain plover eggs, chicks, and even adults. Such an ecological relationship has been demonstrated in the Mojave Desert of California. Increases in roads and traffic have extended the range of avian predators (common raven and red-tailed hawk) exposing young desert tortoises (*Gopherus agassizii*) to much higher rates of predation than before development (Knight et al. 1993, Knight and Kawashima 1993). The BLM's commitment to establish speed limits on project roads should help reduce the availability of carrion to attract predators.

Mountain plovers show high site fidelity to breeding territories between years and the persistence of breeding concentrations may be more important than mere availability of apparently suitable habitat for the persistence of the mountain plover. The necessity of social facilitation for effective breeding has been demonstrated in a number of avian species. Habitat degradation occurring outside of the breeding season may cause abandonment of historically used breeding areas, though no direct mortality of plovers, eggs, or chicks occurs. Removal or degradation of nesting habitat on historically used sites resulted in loss of breeding capability upon the birds' return, and/or resulted in loss of the pair for lack of available feeding or nesting habitat. Development activities, including construction of roads, well pads, and ancillary facilities that degrade habitat in historically used breeding areas could have this effect, whether or not they occur during the breeding season. Human activity associated with project development and operation in historically used breeding areas may cause them to abandon the breeding area, particularly if disturbance extends over more than one breeding season.

The key issue is whether or not birds displaced by project activities will move to new areas and successfully breed. Currently, information is inadequate to answer this question. Dinsmore (2001) found that although large areas of suitable plover habitat may be available at nearby sites in Blaine and Phillips counties, mountain plovers appear faithful to breeding sites and may by reluctant to move even short distances. Until this question is resolved the prudent management approach must be to identify and protect all breeding concentrations of the species.

**Specific phases of gas development and the specific activities that may cause adverse effects are outlined below.**

Development: Given the BLM's existing commitment to survey for plovers and delay work either 37 days, or 7 days post-hatch if any mountain plover nests or broods are found within 1/4 mile of development, the likelihood of ground-disturbing activities (including construction of roads, well pads, pipelines, ancillary facilities) causing direct mortality of plovers is discountable. However, increased traffic to and from other project construction sites may cause direct adverse effects that could result in mortality through collisions with vehicles, and indirectly by increasing predator numbers (by providing road-killed animals), thereby possibly increasing predation on adults, eggs, or chicks. The BLM's commitment to post speed limits within identified nesting areas reduces the likelihood of such effects.

Drilling operations may displace breeding mountain plovers some distance from the pad, making additional nesting habitat unsuitable for some distance around the drill rig, and may constitute harassment. Traffic and risks of vehicle collision will greatly increase during drilling. Any of these factors that incrementally reduce the habitat quality leading to abandonment of a previously used breeding area, or reduced reproductive success, may constitute adverse effects that could result in mortality.

Operation: Though traffic will greatly decrease after construction, operating wells will still require periodic maintenance and visits, thereby maintaining low levels of impact associated with traffic and human activity. Elevated structures on the well pad could provide new nest and perch sites for corvids (i.e., common raven and black-billed magpie) and birds of prey, including ferruginous hawks, golden eagles, great horned owls, and loggerhead shrikes. Presence of these known or suspected predators of mountain plovers and their eggs and chicks will increase the likelihood of mortality. The BLM's commitment to minimize hunting perches within ½ mile of nesting areas will help minimize the effect. Maintenance of producing wells during the breeding season will occasionally produce levels of traffic, noise, and human activities that could lead to direct mortality of mountain plovers or displacement from the vicinity of the well pad. Recreational use of the new road system will cause increased disturbance and risk of vehicle collisions. Any of these factors that incrementally reduce the habitat quality leading to abandonment of a previously used breeding area or reduced reproductive success would constitute adverse effects that could lead to mortality.

Abandonment and Reclamation: Reclamation of drill pads, roads, and pipelines will involve a small increase in traffic, noise, and human activity from operation-level activities, possibly leading to mortality as well as disturbance and displacement of nesting plovers in the area. Reclamation activities initiated during the breeding season, unless adequate surveys determine no birds are present, may crush eggs or chicks or lead to nest failure by displacing attendant adults. Placement of a marker to identify plugged wells may provide a permanent hunting perch for avian predators, increasing mortality risk to mountain plovers or displacing breeding birds from suitable habitat. Reclamation with plant species that produce a long-lasting stand of tall, dense vegetation will preclude nesting by mountain plovers as long as that vegetation persists.

Inter-related and Inter-dependent Effects: The highly interspersed surface and mineral ownership on the analysis area creates challenges for protection of mountain plovers and their habitats. There will be some actions regarding non-Federal surface and/or minerals that would not occur but for a Federal action (i.e., they are inter-related or inter-dependent to the Federal action). ROW's for access to non-Federal in holdings is an example of a common Federal action leading to inter-related and inter-dependent actions on non-Federal lands. Development actions of non-Federal minerals occurring as a result of a BLM action would have the same effects on nesting plovers or historically used breeding areas as such development of Federal minerals, described above. To the extent that these actions are inter-related or inter-dependent to a Federal action, any effects to mountain plovers associated with development of non-Federal minerals must be considered prior to permit issuance or other authorization by the BLM.

## CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The cumulative effects are difficult to quantify for several reasons. Because private surface ownership within the project area is significant, many new wells and many miles of roads and pipelines are reasonably certain to occur on private lands. This is evidenced by the current and historic rates of coal bed methane development on private land throughout the Powder River Basin in Wyoming. However, some of the gas development activities on non-Federal land will require grants of right-of-way from the BLM for access and are, therefore, inter-related and inter-dependent to the right-of-way grants. These grants and inter-related and inter-dependent actions constitute Federal actions subject to review under section 7 of the Act and therefore are not considered under cumulative effects.

The CBM emphasis areas in Montana are within the Powder River Basin. Concurrent proposals for CBM development in the Powder River Basin occur in Wyoming. In Wyoming, the Powder River Basin Oil and Gas Project is located in all or parts of Campbell, Converse, Johnson, and Sheridan counties. The proposed project includes 39,400 coal bed methane (CBM) wells and 3,200 conventional (i.e., non-CBM) oil and/or natural gas wells within a project area of almost 8,000,000 acres. The project also includes construction of associated facilities, including access roads, gas gathering and water disposal pipelines, electrical utilities, and production facilities (such as compressor stations, central delivery point, or well pod buildings and meters), and facilities for treating, discharging, disposing of, containing, or injecting produced water.

In Wyoming, well spacing is expected to occur in an 80-acre spacing pattern (8 wells or well pads per square mile). The potential short-term disturbance during drilling and installation of facilities (up to10 years) is estimated to be approximately 240,000 acres, with 278,633 acres short term disturbance to vegetation. Following reclamation of pipelines and partial reclamation of other facilities the long-term disturbance associated with CBM development would be approximately 108,800 acres, with 128,069 acres long term disturbance to vegetation continuing during the productive life of the project (approximately 20 years).

The Apsaalooke Crow, in Yellowstone and Big Horn counties in Montana, have recently signed an agreement to develop production of an estimated 200 to 600 billion cubic feet of methane gas (Raabe 2002). The Northern Cheyenne, located in Big Horn, Rosebud, and Powder River counties, soon may also enter into similar agreements for CBM development. Reasonable and Foreseeable Development, as presented in the DEIS, estimates up to 8,000 CBM wells could be drilled on the Northern Cheyenne and Crow tribal lands, collectively.

Finally, the data are not adequate to determine the distribution and abundance of the bald eagle, and mountain plover on private lands in the project area. For this reason, the extent of cumulative effects to the species is difficult to quantify. However, given the surface and gas ownership patterns, as well as the current level of development of this private coal bed methane, the direct and indirect effects of these private actions are likely to adversely affect the species addressed in this opinion in a similar manner and to a similar degree as those Federal actions addressed in this opinion.

## CONCLUSION

### **Listed Species/Critical Habitat:**

### Bald Eagle

After reviewing the current status of the bald eagle, the environmental baseline for the action area, the effects of Coal Bed Methane Production in Montana as managed by the Miles City and Billings Field Offices and the State of Montana, and the cumulative effects, it is the Service's biological opinion that the direct and indirect effects of Coal Bed Methane Production in Montana, as proposed, are not likely to jeopardize the continued existence of the bald eagle. No critical habitat has been designated for this species, therefore, none will be affected.

The Service has reached this conclusion, based in part on, but not limited to, the following:

1) The bald eagle has experienced significant recovery across much of its range since listing.
2) The project area encompasses a relatively small amount of the bald eagle's entire range.
3) Higher densities of bald eagles and their nesting territories occur in the northwestern Montana.
4) A relatively small number of roosts sites may potentially be adversely affected by the project.
5) Construction, one of the activities likely to adversely affect the birds, will be of a short duration.
6) Even with anticipated losses from the direct and indirect effects of coal bed methane development, recovery goals in Montana will be achieved.

**Proposed Species/Critical Habitat:**

**Mountain Plover**

After reviewing the current status of the mountain plover; the environmental baseline for the action area; the effects of the coal bed methane development in the project area; and, the cumulative effects, it is the Service's conference opinion that the direct and indirect effects of Coal Bed Methane Production in Montana as managed by the Miles City and Billings Field Offices (loss of some breeding habitat and potentially a few individuals) are not likely to jeopardize the continued existence of the mountain plover. No critical habitat has been proposed for this species, therefore, none will be affected.

The Service has reached this conclusion by considering the following:

1) Mountain plovers are widely distributed throughout their breeding range, with the current population estimated at 8,000 to10,000 individuals (U.S. Fish and Wildlife Service 2002a). This Project would result in the loss of a few individuals or nests and would currently have a relatively minor impact when considering the population as a whole.

2) Suitable habitat for the mountain plover is present, but highly scattered throughout the project area.

## INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, would, kill trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the BLM so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The BLM has a continuing duty to regulate the activity covered by this incidental take statement. If the BLM (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the BLM must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR 402.14(i)(3)].

### AMOUNT OR EXTENT OF TAKE

**Listed Species**

**Bald Eagle**

In the revised biological assessment, the BLM estimated that 27,917 miles of utility power lines (utility corridors) would be developed for an estimated 18,300 wells. A study by Schomburg (2001) documented eagle mortality for collisions and electrocution from small power distribution lines in oil and gas fields in an area that is a sub-sample of the BLM's analysis area for coal bed methane. Although, approximately 65% of the carcasses were recovered during ground surveys in 2000 and 2001, the data collected reflects all known eagle kills that occurred between 1996 and 2001. Schomburg surveyed 4,090 power poles or approximately 231 miles of distribution line. A minimum of 5 eagle carcasses were identified as bald eagle. Four mortalities were due to electrocution and one was due to collision with the wires. Other unknown carcasses (14 unknown eagle carcasses could be bald eagles) were not considered in this determination. Using Schomburg's bald eagle kill rate on projected 27,917 miles of new small distribution lines, it is estimated that 101 bald eagles potentially could be lost per year due to electrocution and collision in association with the proposed project. However, these mortality estimates were extrapolated from an area where most of the power lines had yet to be raptor-proofed. By fully implementing the BLM's conservation measures addressing the reduction of raptor mortality from power lines, the Service believes bald eagle mortality from electrocution would be nearly eliminated. However, some electrocution of bald eagles would likely still occur in rare instances, such as has occurred when two eagles fighting on power lines were electrocuted. Bald eagle mortality may also occur from collisions with power lines.

Although, the Service does not have similar data on bald eagle mortality due to vehicular collisions, it is probable that one bald eagle per year may be killed on the estimated 9,018 miles of proposed roads within the analysis area.

In summary, due to some of the same concerns the Service had in the Tongue River Railroad BO, the extensive project area in the Powder River and Billings RMP planning areas, and the probability that some bald eagles will be lost on distribution lines or due to vehicular collision, the Service anticipates that four bald eagles per year may be lethally taken as a result of CBM project activities.

## Proposed Species

### Mountain Plover

Incidental take is expressed as the number of individuals reasonably likely to be taken or the extent of habitat likely to be destroyed. The Service anticipates up to five mountain plovers per year will be taken due lost productivity on up to 20,000 acres of suitable habitat, and three mountain plovers will be taken annually due to vehicle collisions as a result of this proposed action.

The incidental take is expected to be in the form of direct lethal take of adult mountain plovers and their chicks, harm through modification of breeding behavior, and acres of habitat lost. Habitat loss is defined as the permanent or temporary alteration of suitable habitat in such a way as to displace a species into unsuitable areas or impair/disrupt or prevent normal behavioral patterns such as breeding, feeding or sheltering. Direct lethal take of adult mountain plovers or chicks may occur through vehicle collision. The likelihood of vehicle collision is highest during development but remains elevated through operation and abandonment.

Indirect lethal take, especially of eggs and chicks, may occur through increases in predator abundance due to project features providing increased perch and nest sites around plover nesting areas and increased food sources in the form of carrion caused by vehicle collisions. Displacement of adults from nests or broods long enough to cause take of eggs or chicks through exposure to the elements or predators may occur, especially if people will be nearby on foot for many hours. However, given the commitment to survey for nests within 1/4 mile of a well (in suitable habitat), and the subsequent restriction of delaying work until completion of nesting, most mortality via harm and harassment will likely be avoided.

Displacement of breeding birds from known nesting areas to less suitable nesting habitat may occur due to habitat alteration and cause harm through reproductive failure. Human activity associated with project development and ongoing operation may also cause displacement and could cause take in the form of harassment. Where development increases predator abundance or hunting efficiency, nesting plovers may be displaced to nest in less suitable habitat. Abandonment of previously occupied breeding aggregation areas due to habitat degradation may result. Loss of such a formerly used site would constitute take.

The Powder River and Billings resource analysis areas include 5,009,784 acres of federal mineral estate, of which 1,221,448 acres (24.38%) is mountain plover suitable habitat. The BLM has determined that the project will result in an estimated direct loss of about 75,762 acres of wildlife habitat to well pads, roads, pipeline and utility corridors. We therefore project that approximately 18,471 acres (75,762 acres x 0.2438) of suitable mountain plover habitat will be lost in the project area. This will result in a direct loss of productivity for 5.37 mountain plover pairs annually to direct loss of habitat (density of mountain plover x 18,471 acres of lost suitable habitat = 10.75 or 5.37 pairs). Based on mountain plover productivity data and nest and fledgling success data from Montana, there will be a loss of five chicks annually to direct loss of habitat.

Due to the difficulty in detecting loss of productivity in mountain plovers, the Service will use an estimate of 20,000 acres of suitable habitat as a surrogate measure of take. To produce a brood, a mountain plover needs approximately 160 acres (Fritz Knopf, U.S. Geological Survey, pers. comm. 2002). Therefore the project area has the potential of 7,634 pairs. However, from known mountain plover densities in Montana, the project area should have approximately 355 pairs. We estimate then that 1,164,640 acres of unoccupied suitable mountain plover habitat and 56,800 acres of projected occupied suitable habitat occurs in the project area. Long term impacts need to be avoided in on these acres. Since the BLM has determined that 75,762 acres of wildlife habitat will be directly lost and 24.38 % is suitable mountain plover habitat, 18,471 acres of suitable mountain plover habitat will be lost, only 1.5% of suitable mountain plover habitat in the project area. Allowing for estimate variability, some level of take due to lost productivity would occur on up to 20,000 acres of suitable habitat during the life of the project.

Within mountain plover suitable habitat will be active prairie dog colonies. These acres are of highest value to nesting mountain plovers. These acres are probably limited in number. Due to this, the Service anticipates a portion of take related to habitat loss will occur on active black-tailed prairie dog colonies within suitable mountain plover habitat.

Since mountain plovers are extremely precocious and will leave the nest within hours of hatch, direct mortality as a result of project construction is not anticipated given the BLM's commitments to avoid nests during the breeding season. However, given the estimated number of new roads (9,018 miles) proposed for this project, the Service anticipates some direct mortality as a result of collision with vehicles. Considering the likelihood of vehicular caused mortality, one adult mountain plover and two chicks could be taken as a result of collisions with vehicles. This level of expected mortality will result from vehicular collision while the adult and chicks are foraging along the roads. This level of take is anticipated annually, not cumulatively, during the life of the project.

The Service anticipates such lethal take of the mountain plover will be difficult to detect due to the cryptic nature of eggs and chicks, the dispersed nature of breeding birds, the lack of current distribution data on the analysis area, the rapidity with which carcasses are scavenged, and difficulty of measuring increased mortality of adults, eggs or chicks as a result of increased predator abundance.

In summary, the Service anticipates loss of habitat will result in the take of five chicks annually due to lost productivity during the life of the project. This amount of take shall be measured using the surrogate measure of no more than 20,000 acres of suitable habitat lost to coal bed methane development on federal mineral estate. Additionally, the Service anticipates three mountain plover will be taken annually due to vehicle collisions during the life of the project.

## EFFECT OF THE TAKE

### Listed Species

**Bald Eagle**

In the accompanying biological opinion, the Service determined that this level of anticipated take of the bald eagle is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

### Proposed Species

**Mountain Plover**

In the accompanying conference opinion, the Service determined that this level of anticipated take of mountain plovers is not likely to result in jeopardy to the species or destruction or adverse modification of proposed critical habitat.

## REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of bald eagles and mountain plovers. For the mountain plover, the prohibitions against taking the species found in section 9 of the Act do not apply until the species is listed. However, the Service advises the BLM to consider implementing the following reasonable and prudent measures as they pertain to the mountain plover. If this conference opinion for the mountain plover is adopted as a biological opinion following listing, these measures, with their implementing terms and conditions, will be non-discretionary.

**Bald Eagle and Mountain Plover**

1. The BLM shall ensure implementation of all conservation measures identified and committed to as part of the action as outlined above in Project Description and more fully described in the revised Biological Assessment and Wildlife Monitoring and Protection Plan.

2. The BLM shall ensure direct habitat disturbance does not exceed that discussed in the Biological Assessment, Wildlife Monitoring and Protection Plan, Record of Decision, and evaluated in this Biological/Conference Opinion. Through minimization and monitoring of direct habitat disturbance and habitat loss, indirect disturbance to the species will also be minimized.

3. Reduce the possibility of vehicular caused mortality for bald eagles and mountain plovers.

**Bald Eagle**

1. Reduce the likelihood of disruption of nesting and roosting activities.

2. Reduce the likelihood of electrocution and collision with utility lines.

3. Through minimization and monitoring of direct habitat disturbance and habitat loss, indirect disturbance to the species will be minimized.

**Mountain Plover**

The following reasonable and prudent measures are designed first to avoid direct impacts to nesting mountain plovers through activity-specific nest searches, and second, to avoid or minimize impacts to known nesting aggregations by 1) avoiding or minimizing direct and indirect take of adults, eggs, or chicks on these areas, and 2) avoiding the abandonment of nesting aggregation areas.

1. The BLM shall work to avoid abandonment of nesting areas.

2. The BLM shall limit project-related features that increase the population levels or hunting efficiency of predators of the mountain plover in the vicinity of known plover nest sites.

3. Operators and BLM employees shall be shown how to identify the mountain plover and provided information about its habitat requirements, natural history, status, threats, and possible impacts of gas development activities. Incidental observations of mountain plovers shall be solicited from all operator and BLM field personnel.

4. Through minimization and monitoring of direct habitat disturbance, indirect disturbance to the species will be minimized.

## TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the BLM must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

**Bald Eagle and Mountain Plover**

To fulfill reasonable and prudent measure No. 1, the following terms and conditions for both the bald eagle and mountain plover shall be implemented:

1. In the event that a bald eagle (dead or injured) or mountain plover (dead or injured) is located during construction and operation, the Service's Billings Sub-Office of the Montana Field Office (406-247-7366) and the Service's Law Enforcement Office (406-247-7355) will be notified within 24 hours. The action agency must provide for monitoring the actual number of individuals taken. Because of difficulty in identification, all small birds found dead should be stored in a freezer for the Service to identify.

To fulfill reasonable and prudent measure No. 2, the following terms and conditions for both the bald eagle and mountain plover shall be implemented:

1. The BLM shall monitor all loss of bald eagle (nesting, potential nesting and roost sites) and suitable mountain plover habitat associated with all actions covered under the *Montana Statewide Draft Oil and Gas EIS and Amendment of the Powder River and Billings RMPs* and ROD. Bald eagle nesting, potential nesting and roost sites and suitable mountain plover habitat have been defined previously under 'habitat use' and 'critical habitat' respectively, for each species. The actual measurement of disturbed habitat can be the responsibility of the BLM or their agent (consultant, contractor, etc) with a written summary provided to the Service's Montana Field Office upon project completion. The tracking will include the location and acres of habitat loss, field survey reports, what stipulations were applied, and a record of any variance granted to timing and/or spatial buffers. The monitoring of habitat loss for these species will commence from the date the Record of Decision (ROD) is signed. The actual measurement of disturbed habitat can be the responsibility of the BLM's agent (consultant, contractor, etc.) with a written summary provided to the Service's Montana Field Office semi-annually, or immediately if the BLM determines that action (i.e., Application for Permit to Drill (APD), all facilities or infrastructure) will adversely affect a listed species. However, it is the responsibility of the BLM to ensure that the semi-annual reports are complete and filed with the Service in a timely manner. The semi-annual report will include field survey reports for endangered, threatened, proposed and candidate species for all actions covered under the *Montana Statewide Draft Oil and Gas EIS and Amendment of the Powder River and Billings RMPs* and ROD. The semi-annual reports will include all actions completed under this BO up to 30 days prior to the reporting date. The first report will be due 6 months from the signing of the ROD and on the anniversary date of the signing of the ROD. Reporting will continue for the life of the project.

2. The BLM will initiate informal consultation with the Service when 50 percent of the incidental take exempted in this take statement has occurred for either the bald eagle or the mountain plover. Additional measures may be implemented to further minimize the potential for take of listed species

To fulfill reasonable and prudent measure No. 3, the following terms and conditions for both the bald eagle and mountain plover shall be implemented:

3. As outlined in the guidance and conservation measures in the *CBM Programmatic Wildlife Monitoring and Protection Plan for the Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans* that "All new roads required for the proposed project will be appropriately constructed, improved, maintained, and signed to minimize potential wildlife/vehicle collisions. Appropriate speed limits will be adhered to on all project area roads, and Operators will advise employees and contractors regarding these speed limits."

**Bald Eagle**

To fulfill reasonable and prudent measure No. 1, the following terms and conditions shall be implemented:

1. The appropriate standard seasonal or year-long stipulations for raptors or no surface occupancy for bald eagles as identified in the Billings Resource Management Plan (U.S. Bureau of Land Management 1983), Powder River Resource Management Plan (BLM 1984), and Oil and Gas Resource Management Plan/ EIS Amendment (BLM 1992) will be applied. This includes No Surface Occupancy within ½ mile of nests active in the last seven years and ½ mile of roost sites.

2. Nest productivity will be assessed and conducted by the BLM or a BLM approved biologist in areas with high levels of development (i.e., areas with greater than or equal to four well locations/section) on and within one mile of the project area. Active nests located within one mile of project-related disturbance areas will be monitored between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings per nest).

To fulfill reasonable and prudent measure No. 2, the following terms and conditions shall be implemented:

3. No new above-ground power line should be constructed within the Primary Use Area or ½ mile from an active eagle nest or nest that has been occupied within the recent past. No surface occupancy or use is allowed within 0.5 miles of known bald eagle nest sites that have been active within the past seven years. All other actions will be consistent with the *Montana Bald Eagle Management Plan - July 1994*.

4. Power lines will be built to standards identified by the Avian Power Line Interaction Committee (1996) to minimize electrocution potential. The Service has more specific recommendations that reaffirm and compliment those presented in *Suggested Practices*. It should be noted that these measures vary in their effectiveness to minimize mortality, and may be modified as they are tested in the field and laboratory. Local habitat conditions should be considered in their use. The Service does not endorse any specific product that can be used to prevent and/or minimize mortality, however, we are providing a list of *Major Manufacturers of Products to Reduce Animal Interactions on Electrical Utility Facilities.*

**New Distribution Lines and Facilities**

The following represents areas where the raptor protection measures will be applied when designing new distribution line construction:

4(a) Bury distribution lines where feasible.

4(b) Raptor-safe structures (e.g., with increased conductor-conductor spacing) are to be used that address adequate spacing for each problematic species (i.e., minimum 60" for bald eagles would cover all species).

4(c) Equipment installations (overhead service transformers, capacitors, reclosers, etc.) are to be made raptor safe (e.g., by insulating the bushing conductor terminations and by using covered jumper conductors).

4(d) Jumper conductor installations (e.g., corner, tap structures, etc) are to be made raptor safe by using covered jumpers or providing adequate separation.

4(e) Employ covers for arrestors and cutouts.

4(f) Lines should avoid high avian use areas such as wetlands, prairie dog towns, and grouse leks. If not avoidable, use anti-perching devices to discourage perching in sensitive habitats such as grouse leks, prairie dog towns and wetlands to decrease predation and decrease loss of avian predators to electrocution.

**Modification of Existing Facilities**

Raptor protection measures to be applied when retrofitting existing distribution lines. Problem structures may include dead ends, tap or junction poles, transformers, reclosers and capacitor banks or other structures with less than 60" between conductors or a conductor and ground. The following modifications will be made:

4(g) Cover exposed jumpers.

4(h) Gap any pole top ground wires.

4(i) Isolate grounded guy wires by installing insulating link.

4(j) On transformers, install insulated bushing covers, covered jumpers, cutout covers and arrestor covers.

4(k) When mortalities occur on existing lines and structures, raptor protection measures are to be applied (e.g. modify for raptor-safe construction, install perches, perching deterrents, nesting platforms, nest deterrent devices, etc).

4(l) Use anti-perching devices to discourage perching in sensitive habitats such as grouse leks, prairie dog towns and wetlands to decrease predation, and decrease loss of avian predators to electrocution.

4(m) In areas where midspan collisions are a problem, install line-marking devices that have been proven effective. All transmission lines that span streams and rivers, should maintain proper spacing and have markers installed.

These additional standards to minimize migratory bird mortalities associated with utility transmission lines, will be incorporated into the Terms and Conditions for all APD's and stipulations for Right-Of-Way applications.

To fulfill reasonable and prudent measure No. 3, the following terms and conditions shall be implemented:

5. Inventory and monitoring protocol for the bald eagle will be as described for raptors, with the following additions. Operators will indicate the presence of eagle habitat as previously defined, on their application. Prior to CBM development or construction, surveys of the wooded riparian corridors within 1.0 mile of a project area will be conducted in the winter and/or spring by biologists and/or BLM-approved biologists to determine the occurrence of winter bald eagle roosts. Surveys will be conducted from daybreak to 2 hours after sunrise and/or from 2 hours before sunset to1 hour after sunset by fixed-wing aircraft. Follow-up ground surveys, if necessary, will be conducted during the same time frame. Surveys will be at least 7 days apart. The location, activity, number, and age class (immature, mature) of any bald eagles observed will be recorded and if a roost or suspected roost is identified, BLM, USFWS, and MTFWP will be notified and a GPS record of the roost/suspected roost will be obtained and entered into the BLM GIS database. There will be No Surface Occupancy within 0.5 miles of any identified bald eagle roost sites.

**Mountain Plover**

To fulfill reasonable and prudent measure No. 1, the following terms and conditions shall be implemented:

1. Surface use is prohibited within 1/4 mile of active mountain plover nest sites. Disturbance to prairie dog towns will be avoided where possible. Any active prairie dog town occupied by mountain plover on federally managed surface or federal mineral estate will have Controlled Surface Use, specifically no surface use between April 1 and July 31. This area may be reduced to no surface use within 1/4 mile of an active nest, once nesting has been confirmed. An exception may be granted by the authorized officer after the SMA consults with the FWS on a case by case basis and the operator agrees to adhere to the new operational constraints.

2. Due to the declining status of mountain plover in the analysis area and, the need to not lose this most important and limited nesting habitat, all active black-tailed prairie dog colonies within suitable mountain plover habitat will have No Surface Occupancy (NSO). This NSO will be applied only to federally managed surface acres. This NSO may be modified in an amendment to this biological opinion after analysis of impacts to this preferred nesting habitat is completed (see term and condition 10, below).

3. If suitable mountain plover habitat is present, surveys for nesting mountain plovers will be conducted prior to ground disturbance activities, if ground disturbing activities are anticipated to occur between April 10 and July 10. Disturbance occurring outside this period is permitted, but any loss of mountain plover suitable habitat must be documented. Sites must be surveyed three times between the April 10 and July 10 period, with each survey separated by at least 14 days. The earlier date will facilitate detection of early-breeding plovers. A disturbance-free buffer zone of 1/4 mile will be established around all mountain plover nesting locations between April 1 and July 31. If an active nest is found in the survey area, the planned activity should be delayed 37 days, or seven days post-hatching. If a brood of flightless chicks is observed, activities should be delayed at least seven days (U.S. Fish and Wildlife Service 2002). Exceptions and/or waiver to stipulations can be made through consultation with FWS on a case by case basis.

4. Roads will be located outside of nesting plover habitat wherever possible. Apply mitigation measures to reduce mountain plover mortality caused by increased vehicle traffic. Construct speed bumps, use signing or post speed limits as necessary to reduce vehicle speeds near mountain plover.

5. Native seed mixes will be used to re-establish short grass prairie vegetation during reclamation.

6. There will be No Surface Occupancy of ancillary facilities (e.g., compressor stations, processing plants) within ½ mile of known nesting areas. Variance may be granted after consultation with the Service.

7. In habitat known to be occupied by mountain plover, no dogs will be permitted at work sites to reduce the potential for harassment of plovers.

To fulfill reasonable and prudent measure No. 2, the following terms and conditions shall be implemented:

8. Creation of hunting perches will be minimized within ½ mile of occupied nesting areas. Utilize perch inhibitors (perch guards) to deter predator use.

To fulfill reasonable and prudent measure No. 3, the following terms and conditions shall be implemented:

9. Operators and the BLM shall be provided by the Service with educational material illustrating and describing the mountain plover, its habitat needs, life history, threats, and gas development activities that may lead to incidental take of eggs, chicks, or adults with requirements that these material be posted in common areas and circulated in a memorandum among all employees and service providers.

To fulfill reasonable and prudent measure No.4, the following terms and conditions shall be implemented:

10. The BLM will determine the acreage of occupied black-tailed prairie dog habitat within the suitable mountain plover habitat on federally managed surface acres and on federal mineral estate lands. Further, a reasonable effort should be made to estimate the actual impacts, including habitat loss, CBM development will have on occupied black-tailed prairie dog acres within suitable mountain plover habitat over the project area. The project area is large and certain areas will likely be developed for coal bed methane before others. The BLM, Service, and cooperators, will develop a survey protocol that may include prioritization of subsets of the project area. Based on the results of such analysis, the NSO detailed in term and condition 2 above may be modified in an amendment to this biological opinion.

11. Prior to permit approval, habitat suitability will be determined. The BLM, FWS and MFWP will estimate potential mountain plover habitat across the CBM area using a predictive habitat model. Over the next 5 years, information will be refined by field validation using most current Service mountain plover survey guidelines (U.S. Fish and Wildlife Service 2002c) to determine the presence/absence of potentially suitable mountain plover habitat. In areas of suitable mountain plover habitat, surveys will be conducted prior to ground disturbance activities by the BLM or a BLM-approved

Operator biologist using the Service protocol at a specific project area plus a 0.5 mile buffer. Efforts will be made to identify mountain plover nesting areas that are not subject to CBM development to be used as reference sites. Comparisons will be made of the trends in mountain plover nesting occupancy between these reference areas and areas experiencing CBM development.

12. The BLM shall monitor all loss of mountain plover habitat associated with all portions of this action (operators will indicate the presence of prairie dog towns or other mountain plover habitat indicators on their application). Suitable mountain plover habitat has previously been defined under 'critical habitat' for the mountain plover. The actual measurement of disturbed habitat can be the responsibility of the BLM, their agent (consultant, contractor, etc.) with a written summary provided to the Service's Montana Field Office upon project completion, or immediately if the anticipated impact area is exceeded.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. The BLM must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

**Coordination of Incidental Take Statements with Other Laws, Regulations, and Policies**

The Fish and Wildlife Service will not refer the incidental take of mountain plovers or bald eagles for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. 668-668d), if such take is in compliance with the terms and conditions specified herein.

Please be aware that if take of a bald eagle or mountain plover may occur or nest manipulation is proposed for this project, then either a permit from the Service's Migratory Bird Office in Denver or incidental take coverage is necessary. No nest manipulation is allowed without a permit. If a permit cannot be issued, the project may need to be modified to ensure take of a migratory bird or eagle, their young, eggs or nest will not occur. Incidental take coverage for the mountain plover does not occur until the mountain plover is listed as a threatened species. The mountain plover is currently protected by the Migratory Bird Treaty Act. Therefore, take of this migratory bird is prohibited, the issuance of this conference opinion notwithstanding.

## CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Develop programmatic standards and guidelines to be incorporated into Land Use Plan amendments or revisions for all future actions. Conservation measures should apply to operations and maintenance activities.

2. All existing power lines and other transmission lines within the foraging areas of bald eagles and mountain plovers using the project area and surrounding habitat should be reconstructed to the standards of the Avian Power Line Interaction Committee (1994, 1996), if they do not already meet those standards. Incorporate additional standards to minimize migratory bird mortalities into the Terms and Conditions for all APD's and stipulations for Right-Of-Way applications.

3. Removing carrion from or near roads as soon as possible would minimize the possibility of vehicular collision with bald eagles foraging on or near roads and to avoid attracting avian and mammalian predators of mountain plover. Road-killed animals (excluding migratory birds) should be promptly removed from areas within ½-mile of identified mountain plover nesting areas. In the event that area employees are scheduled by shifts, if possible, work schedules and shift changes should be set to avoid the periods from ½-hour before to ½-hour after sunrise and sunset during June and July, when mountain plovers and other wildlife are most active. The BLM should work cooperatively with industry, county officials and local ranchers to minimize any mortality associated with vehicular traffic.

4. Cottonwood regeneration should be encouraged within the project area through reduction, modification and/or removal of domestic grazing, recreational use, or mineral extraction, if those activities are identified as being a cause of lack of regeneration.

5. Surveys of the entire project area should be conducted for mountain plovers (both nesting and brood rearing activities) to provide an estimate of population numbers in the area, availability of suitable habitat, and impacts of coal bed methane development on this species.

6. Research to better understand the effects of oil and gas development on breeding mountain plovers should be conducted. The focus of research should be to measure recruitment to the fall population, philopatry, and site fidelity between developed and undeveloped mountain plover breeding concentration areas on or near the project area. This effort would require close monitoring of a large sample of breeding adults, and possibly color-marking or radio-marking adults and juveniles.

7. Mountain plover display high site fidelity and their long-term absence from an area may preclude natural re-occupation of suitable habitat. If long term monitoring does not document any significant numbers of mountain plover in suitable habitat in the project area, translocate young mountain plover to unoccupied habitat to attempt re-establishment of local populations. Monitor marked birds to determine success of translocation.

8. Re-establish prairie dog colonies in reclaimed or suitable habitat for nesting mountain plovers by translocating prairie dogs from occupied colonies within the area.

9. Utilize remote monitoring technology to reduce site visits to well pads and ancillary facilities thereby, reducing wildlife disturbances and mortalities.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

## REINITIATION NOTICE

This concludes formal consultation and conferencing on the actions outlined in the April 10, 2002 Revised Biological Assessment regarding Coal Bed Methane Production in Blaine, Gallatin, Park, Carter, Powder River, Custer, Rosebud, Treasure, Wheatland, Sweet Grass, Stillwater, Carbon, Golden Valley, Musselshell, Yellowstone, and Big Horn Counties, Montana. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if the mountain plover is listed. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After listing of the mountain plover as endangered or threatened and any subsequent adoption of this conference opinion, the BLM shall request reinitiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

The portion of the incidental take statement addressing the mountain plover provided in this

conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the mountain plover has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the mountain plover may occur between the listing of the mountain plover and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

Thank you for your assistance in the conservation of endangered, threatened, and proposed species. If you have any questions or comments regarding this biological opinion, please contact Mr. Lou Hanebury, of my staff, at (406)247-7367.

R. Mark Wilson

R. Mark Wilson
Field Supervisor

September 4, 2002
Date

Copies to:
Director, MDFWP, Helena, MT.
Regional Supervisor, MDFWP, R-5, Billings, MT.
Regional Supervisor, MDFWP, R-7, Miles City, MT.
State Director, BLM, Billings, MT.
Forest Supervisor, Custer National Forest, Billings, MT.
Chief, Land and Minerals, BIA, Billings, MT.
Resident Agent In Charge, FWS, Billings, MT.
Field Supervisor, FWS, Cheyenne, WY.
Billings Suboffice, FWS-ES

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